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HANDBOOK FOR INDIVIDUALIZED INSTRUCTION

NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER

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**NAVY PERSONNEL RESEARCH
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San Diego, California 92152**

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HANDBOOK FOR INDIVIDUALIZED INSTRUCTION

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Navy Personnel Research and Development Center

Reviewed by
Joseph C. McLachlan

Released by
J. W. Renard
Commanding Officer

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A handbook and associated study guide and test forms were developed to assist instructors in individualizing courses. The handbook is designed primarily for use at formal school settings and for professional military education courses, but may have potential applications to other training settings.

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FOREWORD

This research and development was conducted under contract N00123-80-C-0847 with the Human Resources Research Organization. This effort was part of the continuing project in support of exploratory development task area CF63-521-080-102 (USMC Training and Education), work unit 03.06 (USMC Professional Military Education). The sponsor was the Education Center of the Marine Corps Development and Education Command (MCDEC), Quantico, Virginia. The project was initiated as the result of FY1980 proposed exploratory development efforts that specified a need for (1) new alternatives to traditional group-paced instructional programs for resident Marine Corps professional military education (PME) and (2) new strategies in nonresident courses that would improve student motivation, provide interaction with peers and instructors, and instructional feedback.

This report, the second in a series, contains the instructional package developed to assist instructors, who are graduates of an individualized instructor training program, in the individualization of their own courses. The first report, NPRDC Special Report 83-19, described the implementation of individualized instruction at the Instructional Management School that trains PME course instructors.

The contracting officer's technical representative was Dr. Michael R. Flaningam. The recommendations made herein are directed to MCDEC as well as to the Chief of Naval Education and Training.

J. W. RENARD
Commanding Officer

JAMES W. TWEEDDALE
Technical Director

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CONTENTS

INTRODUCTION

Problem

Conventional, lock-step, group-paced, lecture courses have been found to have many shortcomings. They are designed to permit the majority of a class to accomplish the objectives of the course, but this usually means that the course is designed to meet the needs of the hypothetical average student. Group testing in conventional courses typically does not provide prescriptive feedback to guide the individual student in subsequent learning activities.

In the lock-step mode, there is little allowance for initial individual differences in prior experience, knowledge level, or aptitude. The conventional mode does not allow individuals to proceed at their own optimum rate of learning and, as a result, the fast learner is often bored, while the slow learner often gives up in despair.

To ameliorate these problems, the military training establishment has expended considerable effort to individualize much of its instruction. Much of this effort has been performed according to the instructional system design (ISD) procedures.[1] Unfortunately, much of the available ISD documentation is quite complex and not sufficiently specific in some areas to assist instructors in the practical application of the procedures to their own courses.

Background

The ISD process has been, and continues to be, applied to a large number of service schools. However, most of these efforts have been for technical training or skill-based activities. Relatively little has been done for officer-level professional military education (PME) courses, which are heavily cognitive or knowledge-based in nature.

This report is the second in a series of reports covering the feasibility of individualization for PME courses in the Marine Corps. The first report[2] reviewed the implementation of an individualized course at a instructional management school (IMS) for training instructors of PME courses. The intent of the course is first to train the PME instructors on the individualization process, and then to assist them in accomplishing the same process for their own courses.

The results of the effort at the IMS were very positive. Students were trained for instructional duties more efficiently and effectively by the individualized course. As expected, however, additional materials were still needed to provide guidance to the graduating instructors in individualizing their own courses. Subsequent effort was then directed toward developing materials that would help these instructors to use ISD procedures upon their return to their own schools.

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[1]Chief of Naval Education and Training. Interservice procedures for Instructional Systems Development (NAVEDTRA 106A). Pensacola, FL: Author, August 1975.

[2]Flaningam, M. R., and Joyner, J. N. Feasibility of individualized instruction for USMC professional military education programs: Phase I. Implementation at instructional management school (NPRDC Spec. Rep. 83-19). San Diego: Navy Personnel Research and Development Center, March 1983. (AD-A126 455)

Purpose

The objective of this effort was to develop materials to assist graduates of the IMS or similar instructor training in the individualization of PME courses.

APPROACH

The materials were developed, in large part, on the basis of experience and techniques gained from implementing individualized instruction at the IMS, Quantico. The emphasis was on the selection and development of materials that would enable the instructors to exercise individualization principles relevant to their particular courses. Existing ISD documents were also reviewed and their relevant aspects adapted and appropriately referenced.

A handbook was developed to guide instructors systematically through the tasks that should be accomplished for individualization. An associated study guide provides the instructors with opportunities to practice needed skills, again with focus on the their own course. Two equivalent tests are also provided for the instructors to take and use as feedback to assist them in identifying areas that they have not been fully understood.

The materials are designed to stand alone, based upon preparation provided at an IMS or similar instructor training facility. However, references are provided for users desiring more in-depth coverage of certain areas.

RESULTS

The Handbook for Individualized Instruction and its associated study guide, test forms, and course forms are provided in the appendix.

RECOMMENDATIONS

It is suggested that the Education Center at the Marine Corps Development and Education Command (MCDEC):

1. Implement and evaluate the effectiveness of these documents for the individualization of relevant resident PME courses at MCDEC.

2. Consider the application of these documents to individualize the nonresident equivalents of the resident PME courses.

It is suggested that the Chief of Naval Education and Training (CNET):

1. Review the materials for potential application to other PME courses and evaluate their effectiveness in other settings.

2. Review and evaluate the materials for application to technical training courses.

APPENDIX

HANDBOOK FOR INDIVIDUALIZED INSTRUCTION

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PREFACE

Deciding whether or not to use individualized instruction is part of the instructional development process. This decision is covered in Marine Corps Order 1553.1, Phase III. In the <u>Interservice Procedures for Instructional Systems Development</u> (NAVEDTRA 106A), this decision is located in Block III. 2: "Specify Instructional Management Plan and Delivery System." This text defines individualized instruction and how to design and manage an individualized system.

Before you study this text, you should have completed an instructor course or instructional manager course. You should be thoroughly familiar with instructional systems development (ISD) and with mastery learning/teaching. You should be able to perform the following tasks:

1. Develop objectives.
2. Develop objective-referenced tests.
3. Sequence objectives.
4. Develop a lesson outline.
5. Develop a self-paced lesson.
6. Validate instructional materials.

A good individualized instruction system is made up of the same components as a good lock-step system: presentations, student response (frequent practice), feedback, and evaluation. It should be based on sound instructional objectives. The main difference between individualized and nonindividualized instruction is the way these components are put together. That is what you will be learning about in the following chapters.

This handbook is aimed at those who want to use individualized instruction in their own courses. However, much of what the handbook contains applies to all instruction, including traditional lock-step courses. This is especially true about evaluation. Most of the rules of good evaluation apply just as much to lock-step courses as to individualized courses. Therefore, you may find useful information here even if you are not planning to individualize.

Appendix A is a study guide for you to use as you read the handbook. Using the guide will help you understand and remember what individualization is all about.

Appendix B provides two equivalent tests for your use in assessing what you have learned from the handbook.

Appendix C contains course forms for you to use with or without revisions in your course.

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LIST OF FIGURES

1.0 INTRODUCTION

"Individualized instruction" means different things to different people. What does it mean to you? Programmed texts? Tape/slide lessons? Videotape? More attention given to students?

Actually, individualized instruction comes in many forms. Some forms use programmed texts but most do not. Some use audiovisual media such as tape/slide, videotape, or even computers. But these media in themselves are not individualized instruction. You can have individualized instruction with or without them.

Individual attention to students is a little closer. Individualized instruction always pays attention to individual students. But it is more than just "extra help if needed." It is systematic attention. Individualized treatment of students is built right into the system of instruction.

1.1 Instruction Systems

What do we mean by system of instruction? Just this: The procedures used from the time the student begins instruction until he or she graduates. That is a system. Figure 1-1 provides a diagram of a traditional (not individualized) instruction system for teaching American history in college.
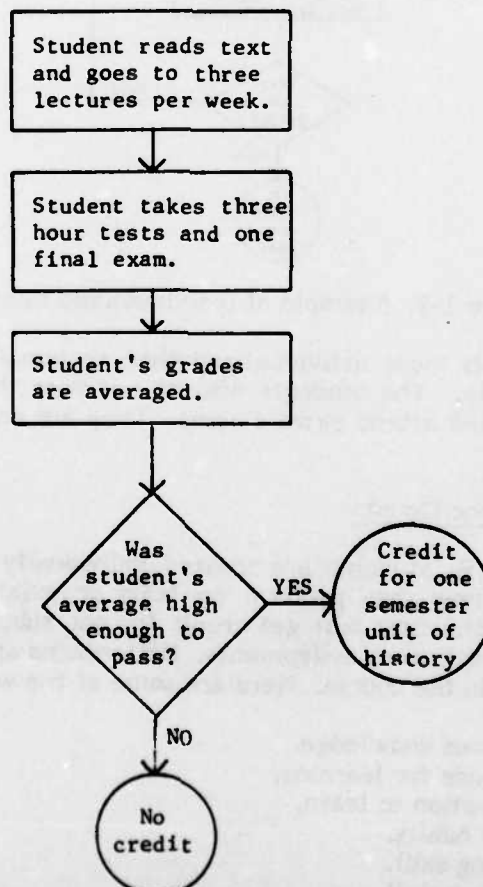
Figure 1-1. Example of nonindividualized instruction (System A).

1

This system is not individualized because it treats all students the same. (It is fair, but it is not individualized.) Figure 1-2 provides a diagram of a more individualized system. In the individualized system, you can see how the student earned credit week-by-week. The standard for the course might be "student must master 13 subunits; 14 subunits = C, 15 subunits = B, and 16 subunits = A."
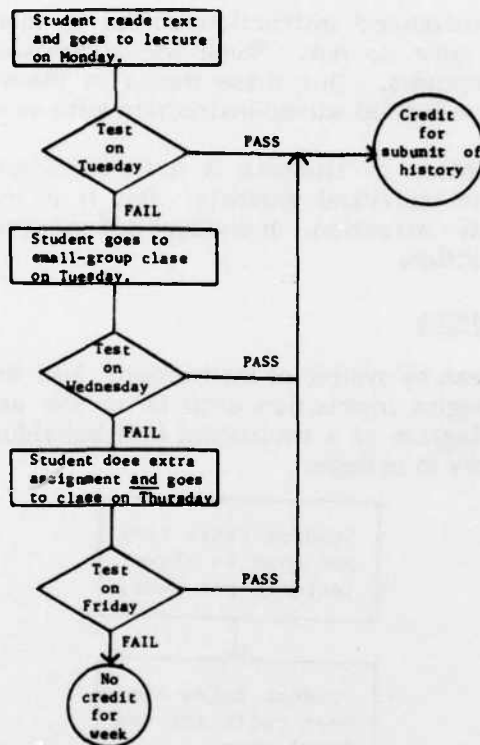
Figure 1-2. Example of individualized instruction (System B).

System B is more individualized than system A because different students get different treatments. The students who do not pass the test after the lecture receive extra assignments and attend extra classes. They are not treated the same way as other students.

1.2   Performance Counts

In system B, students are treated individually according to performance--usually, according to how they perform on tests or quizzes. In system B, for example, students who pass the first test get credit for one subunit and do not have to go to any more classes or do any more assignments. Differences among the students will show up in their performance in the course. Here are some of the ways that students differ:

1.   Previous knowledge.
2.   Aptitude for learning.
3.   Motivation to learn.
4.   Study habits.
5.   Writing skill.
6.   Reading skill.

There are others, of course, but these are enough to think about for now.

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How are you going to treat good readers differently from poorer readers? How are you going to treat students who already know a lot about your subject? What about students with low motivation?

The answer to all these questions is the same: Use individualized instruction. However, individualized instruction comes in many forms. There are many individualized systems already in use. Some of these will be described in Chapter 2. Right now, we will look at some of the things you can vary to individualize instruction. In an individualized system, at least one component of instruction usually varies from student to student.

1.3   Variable Time

Nearly all individualized systems use variable time. By allowing students to study for different periods of time, you automatically allow for many of the ways that students differ. Students who know the subject go faster. Students with a lot more to learn take more time. Students with high aptitude, high motivation, and good study habits and skills learn faster. Students with low aptitude, low motivation, and poor habits and skills will be slower.

These learning differences are very obvious, but many instruction systems do not do anything about it. In nonindividualized instruction systems, the slower students do not get more time. They just learn less. An individualized system usually allows time to vary from student to student.

This does cause some problems. For example, does a student who is not motivated have an unlimited amount of time? No. Notice how this problem was solved in system B. Although slower students were given more time to go to more classes, there was a limit of 1 week. Any student who did not pass a weekly test by the end of the week did not get credit for the subunit.

That is just one example. There are many other ways to combine variable time with time limits. The decision of how much time to allow is part of designing your individualized system. You probably will have to go through a period of trial and error before you get it right.

Another problem caused by variable time is what the faster student should do while the slower students are still working. In system B, a student who passed the weekly test right after the lecture on Monday was not required to attend class on Wednesday or Friday. That is fine for an American history class in college because students who are good in American history can use the extra time to study other subjects that are harder for them or study history at a more advanced level.

However, system B would not always work in military training. If you are training persons for their first job, you do not want to waste time by giving them a lot of time off. It would be better to set up a self-paced system in which students move on as soon as they pass the previous lesson. This allows the faster students to graduate early and get on the job.

In other cases, it might be acceptable to allow a student "free time." At an advanced school like the Command and Staff College, faster students might be able to use extra time for independent study. There is no set formula. You will be looking at various possible individualized systems in the next chapter. The best system for you will depend on the type of course you teach and what your students could do with extra time.

1.4 Variable Method

System B (Figure 1-2) also illustrates one way to vary the method of instruction by using the following four different instructional methods or treatments:

1. Reading assignments.
2. Lectures.
3. Small-group classes.
4. Extra assignments.

Not all students receive all methods. Students who passed the test on Monday received only treatments 1 and 2. Students who failed Monday's test received treatments 1 and 2 followed by treatment 3. Students who failed Wednesday's test received all four treatments.

This is only one way to vary the instructional method. There are many other ways. You may think of some yourself. Again, there is no single formula to follow. The way you vary instructional methods will depend on what you are teaching and what your students are like.

The purpose for using different instructional methods is always the same--to give more help to students who need it. You do not want to spend time giving one-to-one assistance to a student who does not need help. Maybe a written presentation will do. Other students may need more than a text. Controlling the methods of instruction is one of the ways to build an individualized system.

1.5 Media

There are many different media for presenting information: the printed word, a photograph, a drawing, a live voice, a recorded voice, a film, a videotape, and more. The medium of communication is another factor you can vary in individualizing your instruction. For example, if you want to ask your students a question, you could ask it aloud during a lecture. Or you could ask it in a printed text, workbook, or videotape.

Suppose you want to demonstrate good and bad listening habits. You could develop a videotape lesson, a live lecture/demonstration, a tape/slide lesson, or what have you. Can you think of other media?

The media most often used for instruction are the printed word and live presentations such as lectures, seminars, conferences, and demonstrations. However, as more courses are being individualized, instructors are turning away from live presentations and relying more on print and other media, because live presentations have two important drawbacks:

1. They are not easily repeated.
2. They are not easily referred to.

Once a live lecture has been given to a group of students, it is over. It is not practical to give it again to more students the next hour or day. No instructor would want to deliver the same lecture over and over again, nor would it be a good use of the instructor's time. That is one of the differences between the two instruction systems we are discussing. System B used only one lecture, instead of three. For students who had not mastered the lesson after Monday's lecture, system B used other methods: extra exercises and small-group classes. It would not be practical to give the lecture over and over.

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System B is just an example. A lot of other individualized instruction systems do not use live presentations at all. They use the instructor as a personal, one-to-one tutor, like a coach. To present the information initially, these systems use the printed word or audiovisual media like tape/slide. A printed text--like the one you are reading--can be given to students when they need it, as can a workbook--like the ones used at the Marine Corps Instructional Management School (IMS) to teach how to develop instruction.

Print and audiovisual presentations can also be referenced, and students can reread and restudy them as often as necessary. This is not true with live presentations. (Students can look at their lecture notes, but that is not the same.)

The kind of media you should use in your individualized system depends on the kind of system you design. You may design a system that uses live presentations or uses instructors only as one-to-one tutors. You may also develop tape/slide lessons or videotape lessons. We will discuss different systems in the following chapters.

Note. The ideal system. In theory, you need to wait to see how students perform in your course. You could test them before instruction begins to learn their aptitudes, interests, and special skills--"learning style." Then, you could match different instructional methods to different students.

In theory, students who learn best from books would read books, students who learn best from lectures would get lectures, fast students would get less time to study, slow students would get more time, and so on. All students would be treated according to how they learn best. This is the "ideal" individualized system. From the point of view of getting everybody through the system in the most efficient way, it is the best. Unfortunately, such a system is still theoretical. We do not know enough about the way people learn to match methods to students. Maybe we never will.

What "type" of student will learn best from tape/slide? We are not certain. Questions like this are still research questions. Until scientists can tell us more about what makes us tick, we will have to be satisfied with the best practical system we can build. In actual practice, the best we can do is build an instruction system that treats students according to performance.

1.6   Summary

The purpose of individualizing instruction is to help students learn. Because their learning ability, knowledge, skill, and motivation differ, they do not learn the same amount at the same rate. It is safe to say that, if your instruction treats all your students alike, it will not be as effective as if you set up a system that treats students individually by giving them different amounts of time to learn, various instruction activities, or various media.

This handbook tells you how to design and set up such a system. Chapter 2 discusses several individualized systems; Chapter 3, the instructor's role in Individualized instruction; Chapter 4, designing an individualized Instruction system to fit your needs; Chapter 5, the management and control of individualized instruction; Chapter 6, the importance of evaluation in individualization; Chapters 7 and 8 respectively, how to plan and develop tests; and Chapter 9, how to try out and revise tests.

The quality control procedures In Section 5.1 are based on the Instructional Quality Inventory: II. User's Manual (Ellis, Wulfeck, & Fredericks, 1979). The procedures

for developing performance tests (Section 8.3) and for test tryouts (Sections 9.1 and 9.2) are based on workshop materials for the development and validation of skill qualification tests (Campbell, Ford, & Campbell, 1978).

Appendix A provides a study guide for your use as you study this handbook. Appendix B contains two forms of a test for you to take to assess what you have learned in this handbook. Appendix C contains many of the course forms discussed throughout this handbook. You may reproduce these forms as is or revise as needed for your course.

2.0   APPROACHES TO INDIVIDUALIZED INSTRUCTION

All approaches to individualizing instruction are not the same. There are many choices and the choice is yours. However, you will probably want to model your individualized system after one that you already know about. One model is the system used for most of the lessons at IMS, which will be described in this chapter.

Another system is the instructional package you have in your hands, which does not use workbooks. It uses a study guide instead. You may want to model your system after it.

Several other models of individualized instruction will also be discussed in this chapter. As you read about these systems, think how each system would work for your course. Would it work with your students? Your subject? Your classroom facilities? Better yet, think about how you might change some of the things in your course. Maybe rearranging your classroom would allow more individualization. In other words, do not take everything in your present course as a "given." Things can be changed--including the way people think about individualization. It has happened before.

Before you continue, here is a reminder. If you still think that individualized instruction only means "programmed texts" or "tape/slide"--or any other single method-- forget it now. There is a lot more to individualizing than that. To find out what, keep reading.

2.1   Four Questions

A good way to think about individualized systems is in terms of the four questions below. As you look at several different systems in the rest of this chapter, keep these questions in mind.

1. Do all students study the same CONTENT? In many individualized systems, all students study the same subject matter with the same objectives. In other individualized systems, the more advanced students study more advanced content or study "electives." Which would be better for your course?

2. Are all students allowed the same amount of TIME? In Chapter 1, we pointed out that most individualized systems allow time to vary student-by-student. Students who have more knowledge, motivation, or learning aptitude move through the course faster and graduate sooner than do others. In other individualized systems, all students are allowed the same amount of time; for example, an independent study program in which students might be allowed a fixed amount of time to study in their own area.

3. Are all students given the same instruction METHOD? In Chapter 1, we saw the combination of methods used in system B to individualize instruction. Students who did not learn well from one method were given another. In system B, the methods were lecture, extra assignments, and small-group classes. Another system might combine tape/slide with one-to-one tutorial, programmed texts with lectures, or you name it. What methods would work best in your course?

4. Do all students reach the same level of ACHIEVEMENT? You may call this "level of proficiency" or "level of mastery." It all means the same thing. In most individualized systems, there is a single level of achievement ("mastery") for all students.

In other systems, students graduate with different levels of proficiency. For example, in an independent study program in which study time is fixed, faster students might learn more, although all students might be required to meet a minimum standard. In general, if content, time, and method do not vary, level of achievement will. Some students will just learn more than others. It is human nature.

Now let us look at some real-life individualized systems. We will classify each system according to content, time, method, and achievement. As you read about these systems, keep thinking about what kind of system would be best for your situation.

2.2 Workbook/Tutorial System

The individualized system in use at IMS has:

1. Variable content.
2. Variable time.
3. Fixed method.
4. Fixed achievement level ("mastery").

We say that content is variable because the lesson students study depends on their duty assignments. Although most IMS students study the lessons in the instructor track, others may study only a few of these and concentrate on lessons about task analysis. Others may concentrate on evaluation. It all depends on what they need to learn for their job.

The IMS system is a variable time system because performance on tests, not a schedule or the calendar, determines student progress. Some students move through their lessons more rapidly than do others, because they already know some of the subject matter, they are "fast learners," or maybe they are in a hurry. The students who enter IMS are different in many ways; for example, instructional experience, years in service, officer/enlisted, military occupational specialty (MOS), years of education, etc. So it is not surprising that they do not progress at the same rate.

The IMS system is a fixed method system because all students are given the same treatment: lesson workbooks with one-to-one instructor assistance. Of course, the amount of assistance varies from student to student. Some students need a lot of help. Others "whiz" through. The system is still called "fixed-method" because students who fail to master a lesson objective continue to learn using the same methods: workbooks, tutorial help from the instructor, practical exercises, and rehearsed presentations.

Finally, the IMS system has a fixed achievement level because students move to the next lesson as soon as they reach "mastery" on the lesson before. Although one student may learn more than another, all students must achieve the same minimum level. Students are graded on a master/nonmaster basis.

Figure 2-1 shows how students move through IMS. Imagine that students in your course were following this program. Would this be a good individualized system for you?

① Student answers questions in first workbook

② Test — Mastery → ③ Next lesson

Nonmastery

④ Tutorial assistance from instructor

⑤ Retest — Mastery

Nonmastery

⑥ Additional assistance from instructor

⑦ Retest — Mastery

Nonmastery

⑧ Instructor's decision

1. The student receives the first lesson and begins work.

2. Lesson test.

3. If the student achieves mastery on the test, he or she advances to the next lesson.

4. If the student does not achieve the mastery level, the instructor reviews the student's test and shows the student what he or she is doing wrong. The instructor may assign more study.

5. Lesson test.

6. If the student does not achieve mastery, the instructor reviews the test and assigns more study.

7. Lesson test.

8. If the student does not pass after three tests, the instructor (or IMS Director) decides what action is appropriate.

Figure 2-1. Workbook/tutorial system.

We have described the workbook/tutorial system at IMS first, because you are probably already familiar with it. It has several features that are found in many individualized systems:

1. Short lessons (modules).
2. Frequent tests.
3. Testing to "mastery" level.

4. Self-pacing (variable time).
5. Printed workbooks instead of lectures.

2.3 Study Guide System

You are using an individualized system right now. The text you are holding is part of an instructional package. The other parts of the package are a study guide and tests. Although the instructional package was developed to be used at IMS, it is self-contained and could be used anywhere.

How does the study guide system differ from the workbook/tutorial system used for most of the lessons at IMS? One difference is that the study questions are printed separately in the study guide, instead of right along with the lesson in a workbook.

Another difference is that there is more to read in the study guide system. In the workbook/tutorial system, short sections of text are followed immediately by questions, which is where the "tutorial" part comes in. The instructor and the workbook together instruct the student. The instructor does not put a whole lot of information into the workbook. The workbook just gives enough to get the student started. The rest is up to the instructor. In other words, the workbook/tutorial system could never work if an instructor were not on hand at all times. It is not as self-contained as the study guide system.

The study guide system prints more information. The student has more reading to do. Although students who do not understand something in the text can always ask for help, in general, the text contains the information students need.

One advantage of the study guide system is that you can use existing textbooks or other publications like FMFMs. First, you would find one or more publications containing the subject matter your students need to learn. Then, you would write a study guide with lesson objectives, guidance on different parts, and study questions. You would develop only the study guide, not the "source publications."

Are there any source publications for your course? Is the information that your students need to learn already printed in a manual, order, textbook, or other publication? If so, then you could use the study guide system to individualize your course.

The study guide system has these features:

1. Fixed content (text).
2. Variable time.
3. Fixed method (study guide).
4. Achievement level--either fixed or variable.

Figure 2-2 shows how a student would progress through a study guide system if achievement level were fixed.

The study guide system and the workbook/tutorial system are a lot alike; both use printed books to teach the subject. Since the study guide system requires more reading, it might be better for students who are more advanced or better able to study independently. It is also a good bet if you already have a good source publication that contains what the students need to learn.

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Note. A good source publication. Do not fall back on the study guide system just to save the trouble of writing a workbook. If your source publication or textbook is poor, your course will be really poor, and your students will let you know it.

1 & 2. The student reads both the text(s) and the study guide, answering study guide questions along the way.

3. Test on part of text (could be chapter, unit, lesson, etc.).

4. If student passes, he or she goes on to the next unit.

5. If not, the student studies the text again.

6 & 7. The student is tested again, and the cycle continues.
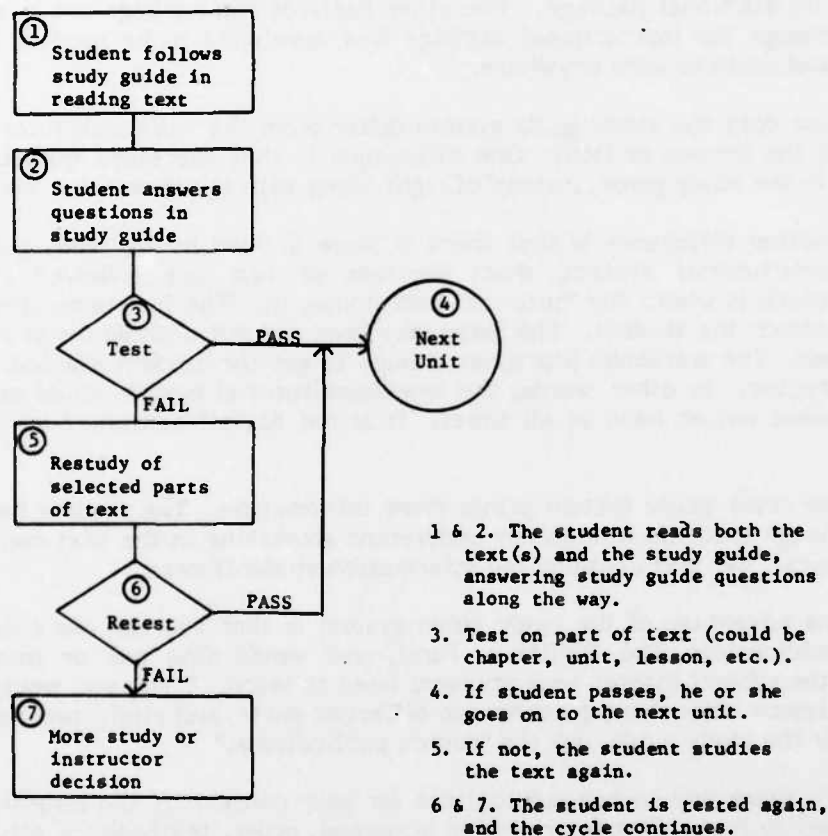
Figure 2-2. Study guide system.

2.4 Fixed-pace Individualization

Fixed-pace and individualized are not contradictions, because not all individualized systems are entirely self-paced. You can individualize a course even though it has a fixed schedule of lectures, audiovisual presentations, seminars, or other methods by allowing both achievement level and individual study time to vary. The system could have these features:

1. Fixed content.
2. Variable time (to study).
3. Fixed method.
4. Variable achievement.

To individualize within a fixed schedule, you would:

1. Present instruction on a fixed schedule.
2. Give your students time to study between presentations.

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3. Give all students a test at a scheduled time.
4. Require students who fail the test to restudy the material.
5. Retest the students who failed the first test.

This way, students who need more time to study can take it and students who have not mastered the subject can be retested until they do. Extra study and retest time are probably not possible in MOS-producing courses. However, it probably is available, if you are teaching a course in the area of professional military education. Figure 2-3 is a diagram of a fixed-pace program.
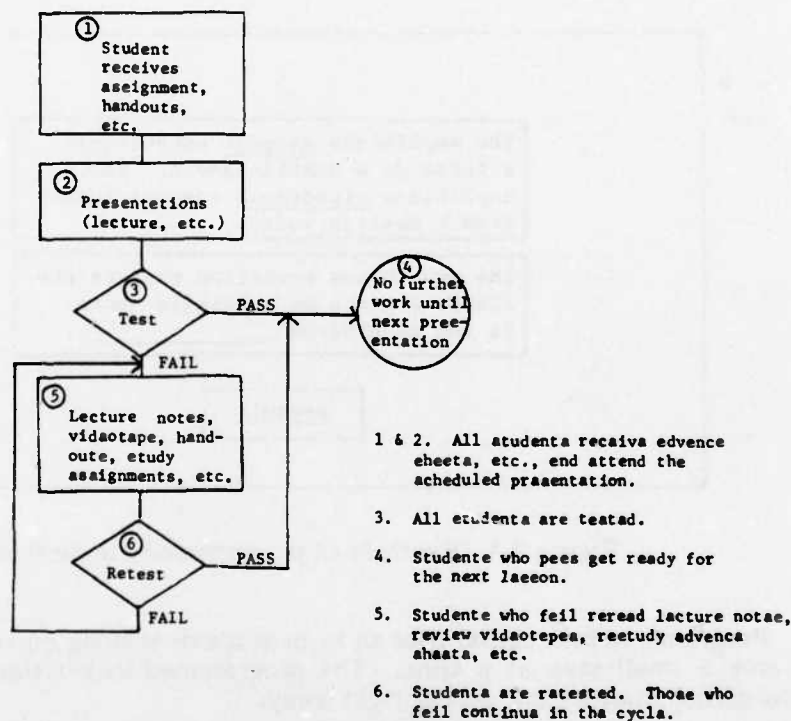
Figure 2-3. Fixed-pace individualization.

In a fixed-pace program, when there are no more presentations, the course is over. Different students will have spent more or less time studying before the presentations, and especially afterwards. Those who prepared well for the presentations and paid more attention during the presentation are more likely to pass the test the first time. Students who did not read their advance sheets are less likely to pass. They have to make up for this by studying more after the presentation.

In this system, the levels of achievement may vary. If some students have not mastered all the lessons by the time the course ends, the course mastery criterion might be a proportion of lessons mastered; for example, 14 out of 16. You could even make it 100 percent, as long as you are prepared for some students not meeting that criterion in the fixed time.

Remember, you can individualize a course with a fixed schedule of lectures, audiovisual presentations, guest lectures, or whatever. The real meaning of individualization is not just "self-pacing." Individualization means treating individual students differently, which you can do even when you teach lessons on a fixed schedule.

2.5   Programmed Instruction

You could build a system around programmed workbooks. Programmed instruction is based on breaking the subject down into very small parts (see Figure 2-4). The idea is to "feed" students just a little bit of content at a time, to check to see if they understand it, and immediately tell them if they are right or wrong.

The amphibious <u>assault</u> establishes
a force on a hostile shore. The
amphibious <u>withdrawal</u> removes forces
from a hostile shore.

The amphibious operation that establishes a force on a hostile shore
is the amphibious _____.

<u>assault</u>
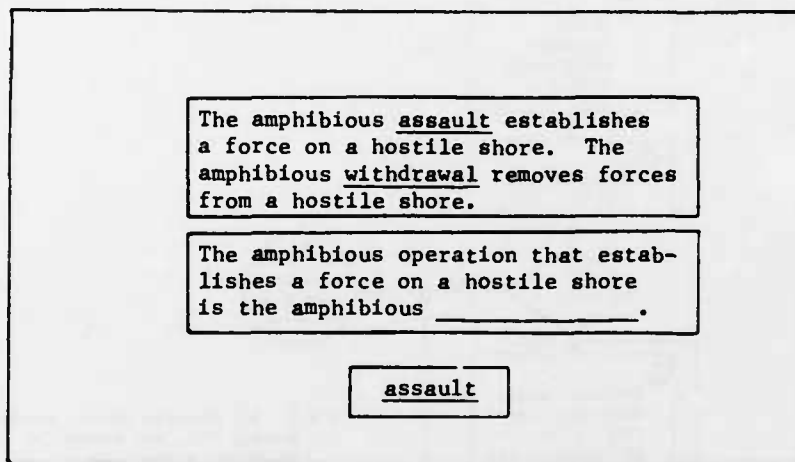
Figure 2-4. Example of programmed instruction.

Programmed instruction tries to keep students making correct responses because it goes only a small step at a time. The programmed instruction reinforces the right answer by giving students the answer right away.

Just like other kinds of instruction, a well-written programmed workbook can be very effective. Remember that programmed instruction is not an individualized system. You still have to build a system to use programmed texts.

Figure 2-5 shows how programmed texts can be used in an individualized system of instruction. The individualized system just described can be characterized by:

1. Fixed content.
2. Variable time.
3. Variable method (programmed text + ?).
4. Fixed achievement.

2.6   Worksheet System

An individualized system that has been used successfully in Army training may be called the worksheet system. In this system, there are no textbooks, workbooks, lectures, videotapes, or any other presentation media. The entire system is built around

Lesson in programmed text

② Test — PASS → ③ Next lesson

FAIL

④ Student restudies selected parts of text

⑤ Retest — PASS

FAIL

⑥ Different method
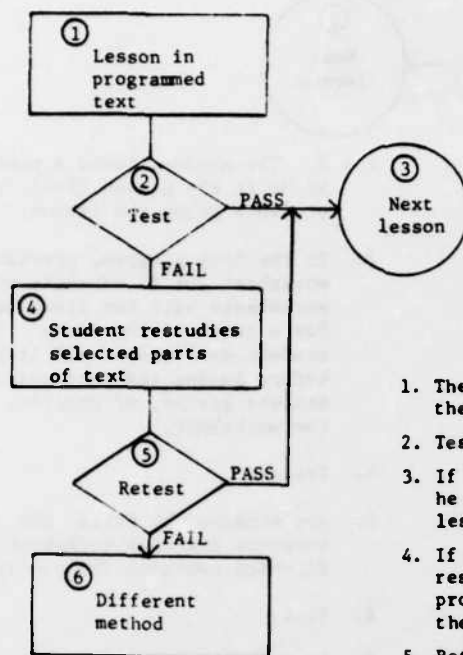
1. The student reads a lesson in the programmed text.

2. Test.

3. If the student passes the test, he or she studies another lesson.

4. If not, the student could restudy the parts of the programmed book that cover the errors on the test.

5. Retest

6. If the student failed the retest, it is doubtful that studying the programmed text any more would help, since he or she has already answered the questions in it twice. Some other method should be used at this point.

Figure 2-5. Example of individualized system of instruction using programmed texts.

practical exercises. Students take a pretest and then (unless they pass) receive worksheet set #1 with lots of practice. Before students are allowed to retake the test, they must produce the correct answer to all the questions on all the worksheets in the set. Any students who fail the test a second time get worksheet #2 and the cycle continues. For students who fail a third test, the instructor must decide whether they should go on to the next lesson or get more practice.

As no information is presented in this system, it can only be used to practice something that the students already know (basically) how to do. For example, processing supply requests is mostly a matter of following specific directions in a publication. It just takes practice and being careful. The worksheet system of individualized instruction is a good way to build up proficiency at such tasks. Figure 2-6 shows how a student moves through a lesson in the worksheet system.

The worksheet system can be classified this way:

1. Fixed content.
2. Variable time.
3. Fixed method (practical exercise).
4. Fixed achievement.

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1 & 2. The student takes a pretest. If he or she passes (90%), the students skips the lesson.

3. In the Army program, practice worksheet set #1 consists of ten worksheets with ten items each, for a total of 100 items. The student must master all items before taking the test again. A student grader, or proctor, grades the worksheet.

4. Test.

5. Any student who fails the test, receives practice worksheet set #2, which contains 100 new items.

6. Test.

7. If the student fail the test a third time, the instructor must decide whether to send the student to the next lesson (without mastery) or assign more practice.

Figure 2-6. Worksheet system.

Only time varies. Although the instructor is always available to help students during the practical exercises, each student has to master each exercise.

2.7 Peer Training System

Peer training or the "buddy system" is an individualized system used in self-paced MOS-producing courses. This system features a series of hands-on performance stations that every trainee must pass. At each station, an instructor does the testing.

This particular system also uses other methods and presentation media. Besides hands-on practice with a peer, the system includes videotape or tape/slide, and—for each lesson—a printed text. The system is classified:

1. Fixed content.
2. Variable time.
3. Variable method.
4. Fixed achievement.

Figure 2-7 shows how a student moves through the peer training system.

2.8 Other Systems

You have just read about six individualized training systems. They are only some of the possibilities you could consider for your situation. To build your own individualized system, you might borrow ideas from all of them. Figure 2-8 compares their content, time, method, and achievement level.
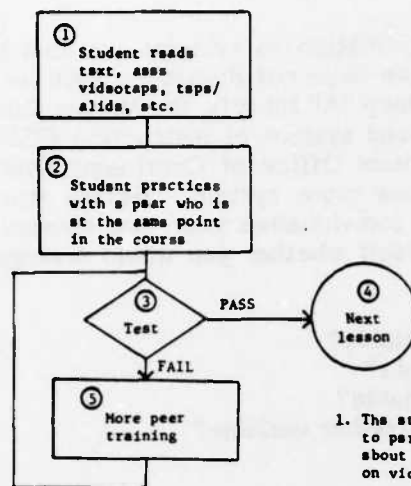
1. The student first studies how to perform the task by reading about it or seeing it performed on videotape.

2. The student practices the task (such as operating a VHF radio) with a partner.

3. Hands-on performance test.

4. As soon as a student passes, he or she goes to the next lesson. If one student passes the test and his or her partner fails, the remaining student finds a new partner.

5. The cycle continues with more practice until the student masters the task.

Figure 2-7. Peer training system.

1. Workbook tutorial
2. Study guide
3. Fixed pace
4. Programmed text
5. Worksheet
6. Peer training

F = fixed
V = variable

CONTENT	TIME	METHOD	ACHIEVEMENT
V	V	F	F
F	V	F	F/V
F	V	F	V
F	V	V	F
F	V	F	F
F	V	V	F

Figure 2-8. Summary of six individualization systems.

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We have limited our examination to systems you can build. There are many other individualized systems that we have not discussed, such as the computer-managed instruction (CMI) used at several Navy "A" schools, the Marine Corps Institute nonresident training system, and the personalized system of instruction (PSI) used at some colleges and by the Naval Postgraduate School Office of Continuing Education. If you individualize your course, there will be one more system. Before you continue, pause for a moment and think how you might individualize your own course. Consider each of the four factors below and say to yourself whether you would arrange for each factor to be fixed or variable:

1. Content--fixed or variable?
2. Time--fixed or variable?
3. Method--fixed or variable?
4. Achievement level--fixed or variable?

2.9   Audiovisual Media

"Audiovisual" is a term used to describe certain media of instruction, not a system of instruction. Any of the systems we have described could use audiovisual materials. Tape/slide, film strip (like cue-see), and videotape programs are the most likely choices because they are all relatively easy to produce. (Motion picture production is more difficult.) Tape/slide is the easiest audiovisual material to update or revise and, if you do not have access to videotape or photographic production equipment, the least expensive.

If you have videotape equipment, you can use it over and over without much additional cost except for maintenance and repair. If you have access to a photography laboratory, filmstrips are fairly inexpensive to make. As far as cost goes, tape/slide, videotape, and filmstrip programs are all cheaper to produce than are motion pictures. Almost anything in a workbook, text, or lecture can be put into an audiovisual format with planning and time. The procedure for developing an audiovisual script is explained in the instructional management course lesson on developing tape/slide lessons.

The main advantage of audiovisual materials is just what the name suggests--sight and sound. Your students hear and see the subject at the same time, which may help them to remember. In general, you should use audiovisual media when they are more efficient than other means such as texts or lectures. A basic lesson on multichannel radio systems might be a good example. If you needed to teach officers and staff NCOs at many levels about multichannel equipment, using a tape/slide or videotape presentation might be more efficient than to repeat the same illustrated lecture over and over. To get the benefits of audiovidual materials, you have to illustrate your subject. Showing a lot of words on a screen and reading them to the students is not much better than giving them a book. (It may not be as good because, with a book, students can quickly reread what they have read.)

If you use audiovisual presentations, remember that you still need all the other parts of an instruction system. Audiovisual media are just ways to communicate information. If you are going to use videotape, for example, you still need to design a system that will use videotape.

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Figure 2-9 shows how an audiovisual presentation can be added to a system that uses a programmed text. In this system, students who fail the first test can study the audiovisual lesson to get ready for the retest. (Of course, we could have given the audiovisual lesson first and saved the programmed text for later.) Students who fail the second test (the retest) could restudy the programmed text, the audiovisual lesson, or both.
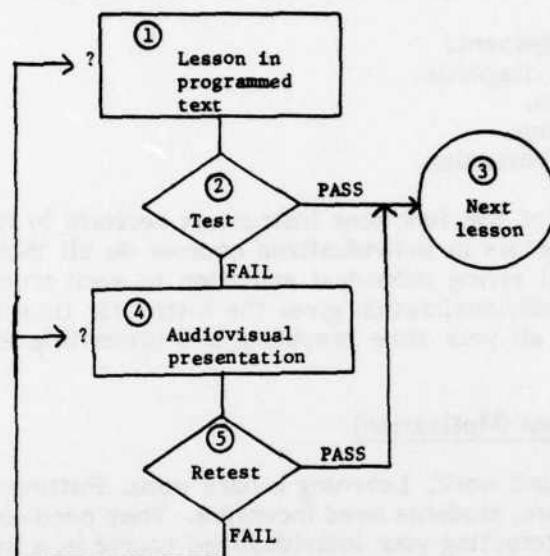
Figure 2-9. Example of the use of audiovisual presentations in an individualized system.

2.10 Summary

There are many, many ways to individualize a course. You can vary the content, the time, the instruction method, and the student's achievement level, all four, or any combination. In this chapter, you saw several systems illustrated. By now you should have some ideas about how your own course could be individualized. Remember that you do not have to copy any system "as is." Borrow ideas as freely as you can to create an approach that fits your situation. Finally, remember that audiovisual media can make your course more effective. You have to build an individualized system for the audiovisual media to fit into because audiovisual media themselves are not substitutes for an individualized instruction system.

In this chapter, we also mentioned the role of the instructor from time to time. The instructor's role in an individualized system is generally more demanding. The next chapter tells you why.

3.0   THE INSTRUCTOR'S ROLE

A mistaken idea some people have about individualized instruction is that you can "get rid of the instructor" when you individualize a course. The truth is that the instructor is more important than ever and will also have a lot more to do. The big change for instructors is that they may not be giving "stand-up" presentations anymore. However, that does not mean that all they do is grade tests. Every instructor should perform at least the following five functions for the students in an individualized course:

1. Encouragement.
2. Problem diagnosis.
3. Feedback.
4. Counseling.
5. Direct instruction.

This looks like a list of the functions instructors perform in lock-step courses, which is just the point. Instructors in individualized courses do all these things on an individual basis. You might call giving individual attention to each student the "bad news." The "good news" is that individualization gives the instructor time to do these things. When you are not spending all your time preparing and presenting lectures, you have time to help students.

3.1   Encouragement (Motivation)

Studying is hard work. Learning is hard work. Putting up with a tough instructor is hard work. Therefore, students need incentive. They need some motivation to keep at it. No matter how interesting your individualized course is, a live, breathing human being is needed to bring it to life. (The more alive the better. If the instructor seems dull, the subject will seem dull, too.)

In a lock-step system, the instructor often tries to bring the subject to life in a lecture. Often, however, the lectures are not so lively, because it is hard to know what will inspire each individual in the class at the same time. Individualization can make motivating easier because it is easier to encourage on a one-to-one basis.

The instructor personally delivers encouragement, motivation, incentive, or whatever you call it in an individualized course. You have to be willing to dig in and work with the student if you are going to individualize. You cannot stay on the platform.

When does the instructor provide motivation? Since there is usually no lecture, you cannot just "plug" motivation into the lesson plan. However, you can find ways. Some students need reassurance. Others need a goal to shoot for. Some need support because they are weak in the subject. Others need a verbal shove to get moving. You can tell these things. You get to know what different students need by working with them.

In an individualized course, the instructor can provide some words of encouragement:

1. Before a student begins work for the day.
2. After correcting a student's work.
3. When a student needs an explanation.
4. At the end of a test or class session.

These are only a few of the obvious times. An instructor in the classroom will find many more. The important thing is to avoid the notion that individualized instruction means a "hands-off" attitude toward motivating students. This attitude is incorrect. Do not believe instructors who say they will not have anything to do if their course is individualized.

3.2 Problem Diagnosis

Instructors absolutely must diagnose problems that students are having with the instruction. Suppose you are the instructor. If one of your students fails to master a lesson, who will find the reasons for the failure? If the student had understood the problem, there probably would not have been a problem, which leaves the instructor to find out why the student did not master the lesson. Figuring out what the student is doing wrong is probably the biggest single part of the instructor's job in individualized instruction. There is not much point to individualizing unless you are going to diagnose students' work individually.

The word diagnose means more than just approval or disapproval. These are part of providing feedback, which we will discuss next. Right now we are talking about figuring out what the students are doing wrong. To figure out their problem, you cannot just look at a test score. To say, "You are doing terribly," does not help much either.

First, find out what the students are doing. You have to know how they solved a problem, for instance, before you can tell them where they went wrong. Do not start by telling them how to do it right. You are probably better off letting the students tell you what they did.

Example: Suppose the subject is fire support coordination. If a student works a problem and gets the wrong answer, get him or her to walk through it step-by-step. Do not correct; just listen and then you can tell the student why he or she got the wrong answer.

Sometimes the problem is obvious and you can tell the student at once how to get right answers instead of wrong ones. A lot of the time, however, you have to do some detective work and figure out what is happening inside the student's head. Is it confusion between two new terms? Is it misunderstanding a new concept? Is it a wrong assumption? Let the student do some talking before jumping in. Remember to try to figure out how the student can avoid the same mistake later. If the student makes the same mistake again, maybe the instructor's diagnosis was incomplete.

3.3 Feedback

How am I doing? Am I doing it right? These questions are very basic. When you are trying to learn something, you need to know whether or not you are catching on. Another critical aspect of the instructor's job in an individualized course is to answer these questions for all the students and individualization allows the instructor more time to do it. (In a lecture, you cannot tell if each student understands.) Although good instruction materials also tell students how they are doing, they are never enough. Because individuals react to instruction differently, you cannot predict all the ways in which students can go wrong.

The instructor in any instruction system--including individualized instruction--has to tell students whether their work is "on or off target," and, in other words, steer the

students toward perfect performance. Guide. Coach. The more "corrective feedback" that students get, the faster they will get where they are going.

The classic military example of corrective feedback is in long-range gunnery. Artillery and naval gunfire need feedback to destroy a target. The forward observer (FO) or naval gunfire spotter is the "instructor" who, by calling in corrections, steers the rounds closer and closer.

Long-range gunfire needs feedback to be effective; students need feedback to learn. Without feedback from the instructor, the students are not effective. (They will eventually learn because they can get feedback from the instruction materials, just as the artillery could eventually neutralize a target without an FO--but a lot of energy will be wasted if there is no guidance along the way.)

Part of the instructor's job in an individualized course is to give feedback--to coach, to guide, and to steer. This is one more reason why it is wrong to think that individualization means "getting rid of the instructor." The best time for the instructor to give feedback is when the students are practicing. To make practical exercise effective, the students need feedback about their performance. The instructor should tell the students what is wrong, what is right, and how to improve.

1. Give complete feedback. Good feedback is complete. It consists of more than just right or wrong, but includes diagnosis too. If the instructor can tell the students why they are "off target," that is all the better.

2. Give feedback immediately. During a series of practice trials, give feedback after each trial. Do not wait until the same mistake has been made twice to correct it. Would an FO call more rounds into the wrong coordinates before he gave a correction?

3.4   Counseling

In an instruction system, there will be "students with problems" and "problem students." Students with problems come to the instructor for help (or the instructor knows they need help). It may be an academic or personal problem.

Instructors refer serious personal problems to someone with professional training, because they are not trained professional counselors. Instructors in individualized courses should counsel students with academic problems, just as they would in lock-step courses.

Problem students give the instructor problems (you might say the instructor has problems caused by the students). Maybe the students are absent too much, late, or not trying. The same problems occur in individualized instruction as in lock-step courses.

Again, individualization allows instructors more flexibility in conducting a counseling session. It does not have to be after duty hours, but can be on the spot, because the instructor will not be taking time away from the whole class. For more information on this role of the instructor, look at the instructional management course lesson on counseling.

3.5   Direct Instruction

Direct instruction is communicating content to the students. Although most of the instruction in an individualized course is delivered by materials and not by an instructor, there are many things the materials cannot teach.

In a course teaching communication, for example, instructors may demonstrate some procedure or model some task so students can see how to do it. There are many opportunities like this in individualized courses.

Remember that direct instruction does not have to be given to the whole class at once. You can individualize a course and still give one-to-one demonstrations. The difference is that in the individualized course you have more chance to tell whether the student understands what you are demonstrating.

3.6   Summary

An instructor in an individualized course must provide encouragement, problem diagnosis, feedback, counseling, and some direct instruction to all students individually. All instructors should perform these duties in all courses; however, in individualized courses, the emphasis is more on the first four duties and less on the fifth, direct instruction. That is part of the point of individualized instruction. Instructional materials provide most of the direct instruction, which gives the instructor more time to motivate, diagnose learning problems, and provide feedback and counseling. Human beings generally do those things better than do videotapes or texts.

4.0   DESIGNING YOUR INDIVIDUALIZED SYSTEM

To put an individualized system together, you need to decide which factors to vary in the system. In Chapter 2, you saw how different systems vary the content, time, method, and achievement level. You also need to think about how to include each of the basic components that belong in any instruction system: presentation, student response, feedback, and evaluation. You have already learned about these in your instructional management course. As including all of the basic components is even more important in an individualized system, this chapter will begin by reviewing them.

4.1   Instruction System Components

The simplest instruction system has one part: presentation. An example of this system is:

<div align="center">

FILM.

</div>

Have you ever attended a mandatory class, perhaps on the Geneva Conventions? Often it consists only of showing a film.

A slightly more advanced instruction system has two parts: presentation and evaluation. For example,

<div align="center">

LECTURE + TEST.

</div>

The class in American history described in Chapter 1 is an example of such a system. There are just two parts: The instructor talks and the students respond on a test. Most instruction systems have more parts than these. You should include all four parts in any instruction system you build (even a lock-step system); however, they are even more important with individualized instruction. With lock-step system, you can "cover" your mistakes on the spot. If you leave anything out of an individualized system, look out! Once again, here they are:

1. Presentation.
2. Student response.
3. Feedback.
4. Evaluation.

Obviously, the goal of the instruction system is to get the content over to the students. In the past, many instructors did not think about anything but packaging the content in the best lecture they could give. They took the "fire-and-forget" approach: Shoot the content at the students and hope you hit as many as possible. That is not the most effective system for covering the target.

The other parts of your instruction system are important too. Each serves a purpose in getting the students to learn. We will address them one by one.

4.1.1 Presentation

A presentation is any input to the students, including a statement of the learning objective, explanations, modeling of performance, examples of the desired product--any transfer of information. Presentations may be made by instructional materials (texts, videotape program, film, tape/slide program), by instructors, and by other students.

Remember that this is only one part of the system. It is not enough just to put forth the subject to the students. You have to think about how you are going to make sure they learn the content. (If you think that is the students' problem, you are wrong. That is like saying that a basketball coach has no responsibility for the team's record.)

4.1.2 Student Response

Output from the students includes activities such as asking the instructor questions, answering questions, rehearsing behavior to be learned, and completing practice exercises. This item is often forgotten by instructors, who tend to fill up an entire lesson with their presentation. This leaves no room for active response by the students.

Students learn better when they respond actively to instruction instead of just listening. Practice, or some other form of response, keeps them alert and helps them remember what they have learned. A good example is the "conference group" method of instruction. When students are actively engaged in responding to a problem, they can learn more than if they are just "talked to."

Questions are the simplest form of student response. Even a simple instruction system (like lecture plus test) allows students to respond to the lecture. A more advanced form of student response is practice, as in conference groups. With individualized instruction, it is important to allow lots of practice. That is when the instructor can see how the students are doing.

4.1.3 Feedback

Practice must be followed by feedback. Any student response must be followed by feedback. In a lecture, feedback is simple. If students ask questions, the instructor just answers them--that is feedback.

In your individualized system, you will have to plan for feedback, since it does not just happen. In Chapter 3, you read that giving feedback was part of the instructor's job. There are also several other ways to give feedback.

The most obvious one is answers to practice exercises. In the workbook/tutorial system, the answers are at the back of the workbooks. In a tape/slide lesson, you can include feedback on practice questions right on a slide or on the audiotape. For example, after the students have been given the question, the next slide can give the answer.

Another time you will give feedback is after a quiz or test. In your individualized system, you can critique the performances of all students separately. Often, an individualized system requires students to master a unit before proceeding, so the students may have to take more than one test on the same subject. Feedback on test performance is especially important. You have to tell the students what they are doing wrong so they can improve.

Feedback should come as soon as possible. After the students have finished a practical exercise or a test, you should give the feedback right away. This means planning your individualized system so that feedback will occur at the right time.

4.1.4 Evaluation

Evaluation is a step you probably will not leave out. Almost everyone includes a test in instruction and individualized instruction usually requires a lot more testing than lock-step instruction. The reason is simple. In lock-step instruction, the student often just takes a final test, such as an American history exam. If the students pass or not, the instruction system often does nothing about it.

Individualization provides the students and instructor with opportunities to review the test and make sure the students understand what is being taught. If students do not pass, the system usually has more instruction and more tests available. Tests are used to control the student progress through the program. You will probably have a lot more tests than you would in lock-step. You will probably also need three or more forms of each test with different items. You may not want to give the same questions again to a students who did not master a lesson.

How to construct tests is covered in Chapter 8 of this handbook, in Marine Corps Order 1553.1 (Phase III), in Interservice Procedures for Instructional Systems Development (Phase II) (NAVEDTRA 106A), in the instructional management course lesson on test construction, and in the Handbook for Testing in Navy Schools (Ellis & Wulfeck, 1982).

4.1.5 Summary of Instruction System Components

We have reviewed four "building blocks" that you should put in your individualized instruction system:

1. Presentation.
2. Student response.

3. Feedback.
    4. Evaluation.

In fact, these four components belong in any instruction system. In an individualized system, none of these parts can be left to chance. You have to plan how you will incorporate each into the system. This makes an individualized system harder to plan than a lock-step system. Also, the better you plan your system, the better it will work.

We will now take an individualized system that you are familiar with and see how each of these parts is included. We will use the workbook/tutorial system at IMS as an example. Notice that tests serve both as student responses and evaluations.

    1. Presentations. The student reads instructional workbooks.

    2. Student response. The student:

        a. Answers questions in the workbooks.
        b. Develops products (lesson plans, tests, objectives, 15-minute presentations, etc).
        c. Asks questions.
        d. Answers instructor's questions.
        e. Takes tests.

    3. Feedback. The student:

        a. Reads the answers to the questions in the workbook.
        b. Is told the good and bad points of his or her products.
        c. Is told what he or she got right/wrong on the tests.
        d. Receives answers to his or her questions.

    4. Evaluation. The student takes lesson tests.

Study the ways these parts of an instruction system have been included in the workbook/tutorial system at IMS. Now think about how you would include them in a course you might design.

4.2   Your System's Program

Figure 4-1 shows the basic program you should have in mind to build your individualized system. The actual program you need to build is more complicated. You need to build in repeated responses and feedback within each lesson or module, as shown in Figure 4-2.

In a real-life example of repeated student responses and feedback from the IMS lesson on developing objectives, students are learning how to write the behavior portion of a learning objective. Figure 4-3 shows the first student activity. The first feedback, which is answer key #2, is shown in Figure 4-4. Figure 4-5 presents a second student activity; and Figure 4-6, the feedback (key #5).

1. **Presentation.** Here you introduce a portion of the content, such as one lesson or module.

2. **Student response.** Here you have the student practice or respond to the presentation in some way.

3. **Feedback.** Here you provide answers to the questions the students have completed or you provide models of the correct response for practice exercises.

4. **Evaluation.** Here you find out whether the student has mastered the lesson.
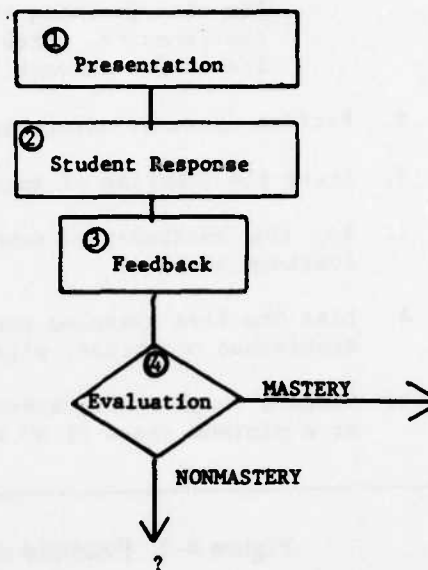
Figure 4-1. Basic program for instruction.
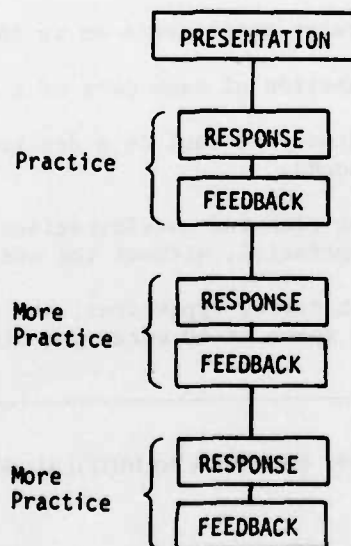
Figure 4-2. Repeated response and feedback.

For each learning objective below, underline
the behavior. (See Key #2 at the end of the
lesson for answers.)

1. Perform operator maintenance on on AN/PRC-77.

2. State the function of each part of a carburetor.

3. Run the hundred-yard dash on a dry track within
    fourteen seconds.

4. List the five planning considerations for conducting an
    amphibious operation, without the aid of references.

5. Given a rough draft, typewriter, and paper, type a letter
    at a minimum speed of 40 words per minute.

Figure 4-3. Example of initial student response.

1. <u>Perform</u> operator maintenance on an AN/PRC-77.

2. <u>State</u> the function of each part of a carburetor.

3. <u>Run</u> the hundred-yard dash on a dry track within
    fourteen seconds.

4. <u>List</u> the five planning considerations for conducting an
    amphibious operation, without the aid of references.

5. Given a rough draft, typewriter, and paper, <u>type</u> a letter
    at a minimum speed of 40 words per minute.

Figure 4-4. Feedback to initial student response.

PRACTICE: In the following objectives,

   1. Underline the BEHAVIOR.

   2. Check whether the action is observable or
       unobservable. (See Key #5.)

1. Given the values for voltage, current, or resistance of an
    electrical current, calculate the unknown values, using Ohm's law.

       ____ observable   ____ unobservable

2. Given the appropriate TM, be familiar with the lubricating
    procedures for the M16 rifle.

       ____ observable   ____ unobservable

3. Without aid of references, know the major steps of logistic
    planning in accordance with FMFM 4-1.

       ____ observable   ____ unobservable

4. Define in writing the key financial management terminology
    utilized within the Marine Corps.

       ____ observable   ____ unobservable

Figure 4-5. Example of second student response.

1. Given the values for voltage, current, or resistence of an
    electrical current, <u>calculate</u> the unknown veluee, using Ohm's lev.

       ✓ observable   ____ unobserveble

2. Given the appropriate TM, <u>be femiliar with</u> the lubriceting
    procedures for the M16 rifle.

       ____ observable   ✓ unobservable

3. Without eid of references, <u>know</u> the major eteps of logistic
    planning in eccordance with FMFM 4-1.

       ____ observeble   ✓ unobserveble

4. <u>Define in writing</u> the key financiel manegement terminology
    utilized within the Marine Corpe.

       ✓ obeervable   ____ unobserveble

Figure 4-6. Feedback to second student response.

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Figure 4-7 is a more complete diagram of an individualized instruction system showing how to include repeated student responses and feedback.

```
                    ┌──────────────┐
                    │ FIRST PART   │
                    │ OF LESSON    │
                    └──────┬───────┘
                           │
    ┌──────────────────────┴─────────────────────────────────────────┐
    │ STUDENT RESPONSE,  FEEDBACK,  RESPONSE,  FEEDBACK,  ETC.        │
    └────────────────────────────────────────────────────────────────┘

            ┌──────────────┐
            │ NEXT PART     │
            │ OF LESSON     │
            └──────┬────────┘
                   │
    ┌──────────────┴─────────────────────────────────────────────────┐
    │ STUDENT RESPONSE,  FEEDBACK,  RESPONSE,  FEEDBACK,  ETC.        │
    └────────────────────────────────────────────────────────────────┘

         NO        ◇ IS       ◇
                   LESSON
                   OVER?

                     YES

             ◇ TEST ◇   PASS ──────────────────────      ◯ NEXT
                                                            LESSON
                  FAIL

            ┌──────────────┐
            │ MORE          │
            │ INSTRUCTION   │
            └──────┬────────┘

             ◇ RETEST ◇   PASS

                  FAIL
```

Study this flow chart carefully. In the next section you'll be asked to provide each of these parts in an individualized system of your own.
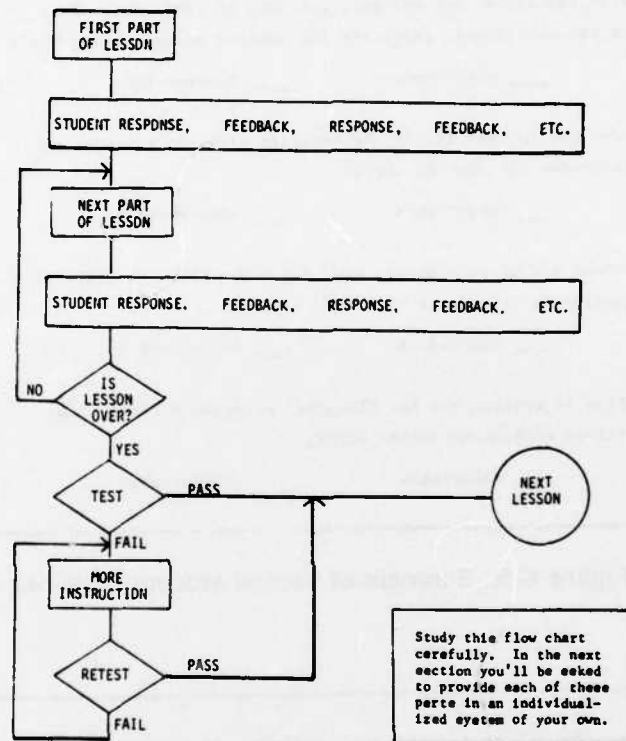
Figure 4-7. Complete individualized instruction system.

4.3   Providing Presentations

Figure 4-8 shows the presentation component of an individualized instruction system. How to present the content of your course is usually the first question you will answer in individualizing. Will you use one method of presentation or several? Here are some of the possibilities (more are listed in the Interservice Procedures for Instructional Systems Development, Phase III (NAVEDTRA 106A), Appendix A):

1. Printed text or workbook.
2. Videotape.
3. Tape/slide.
4. Motion picture.
5. Closed-circuit television.
6. Computer.
7. Lecture/demonstration.
8. Conference group.
9. Teleconference.
10. Programmed text.
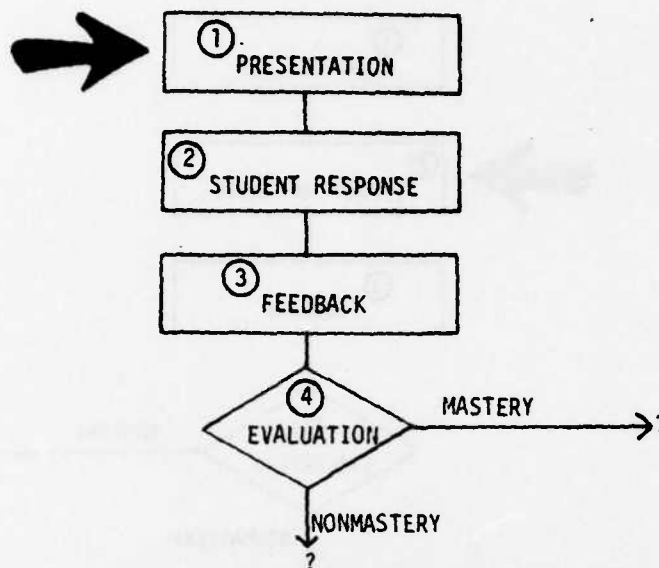
Figure 4-8. Presentation component.

Of course, the decision about what presentation mode(s) to use must be based on what you are teaching--on the objectives of instruction. A presentation mode such as a demonstration, for instance, might be good for teaching how to conduct a river crossing. For a conceptual subject such as national security policy, however, a physical demonstration is not really needed.

For some objectives you will have to represent motion or color. For others, you may only need words. The procedures for selecting methods of presenting content are spelled out in Marine Corps Order 1553.1, in the Interservice Procedures for Instructional Systems Development (NAVEDTRA 106A), and in the IMS lesson on selecting instructional methods and media.

Suppose, for example, you determined that a tape/slide presentation would be best for presenting content, at least at first. In that case, your program would begin to look like this:

> Student views tape/slide
> for first part of lesson
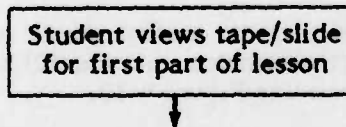
4.4 Providing for Student Response

Figure 4-9 shows the student response component. Some commonly used ways for the students to respond to the presentation are to:

1. Provide study questions such as fill-in-the-blank and true/false.

2. Provide a short multiple-choice quiz.

3. Describe a problem or case history and require the student to give a solution or opinion. Example: "Fire mission called to 3/11 on 840810 by artillery forward observer with 2/7. What should the fire support coordinator do?"

29
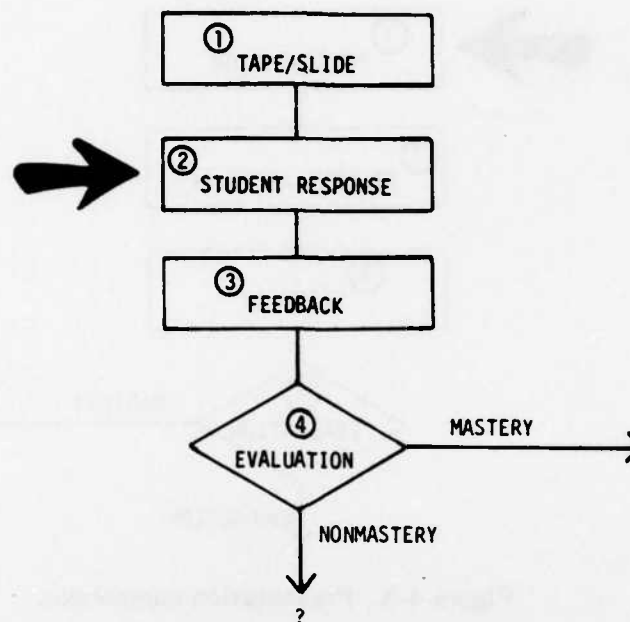
Figure 4-9. Student response component.

4.   Provide drill or practice exercise in which the student does the same thing many times to build up speed and accuracy. Example: Require the student to identify a succession of threat and friendly armored vehicles.

5.   Require the student to create a product. Example: Write an objective, fill out a form, or develop a scheme or maneuver.

The kind of student activity you should provide depends in part on what you are teaching. If you are teaching concepts, give lots of examples. If you are teaching any recognition skill, give lots of drill-type practice. The kinds of student activities needed to teach different objectives are spelled out in the Interservice Procedures for Instructional Systems Development (NAVEDTRA 106A) and in the Instructional Quality Inventory: II. User's Manual (Ellis, Wulfeck, & Fredericks, 1979).

Suppose you determined that the student should respond to the presentation in two ways: (1) by taking a short multiple-choice quiz and (2) by creating a written product. In that case, your system would look like Figure 4-10.

4.5   Providing Feedback

You may have noticed a problem in Figure 4-10. Since there are two kinds of student response, there should be two kinds of feedback. The response-feedback combination should really look like that shown in Figure 4-11.

However, you could also use the results of the first response to determine whether or not the student needs more practice, as shown in Figure 4-12. In this example, a student who scored 90 percent on the quiz would continue. A student who scored below 90 percent would stop and create a written product. Building alternate pathways like this into your instruction program is called branching. By providing two different branches, faster students can keep moving and students who need more practice can get more practice.

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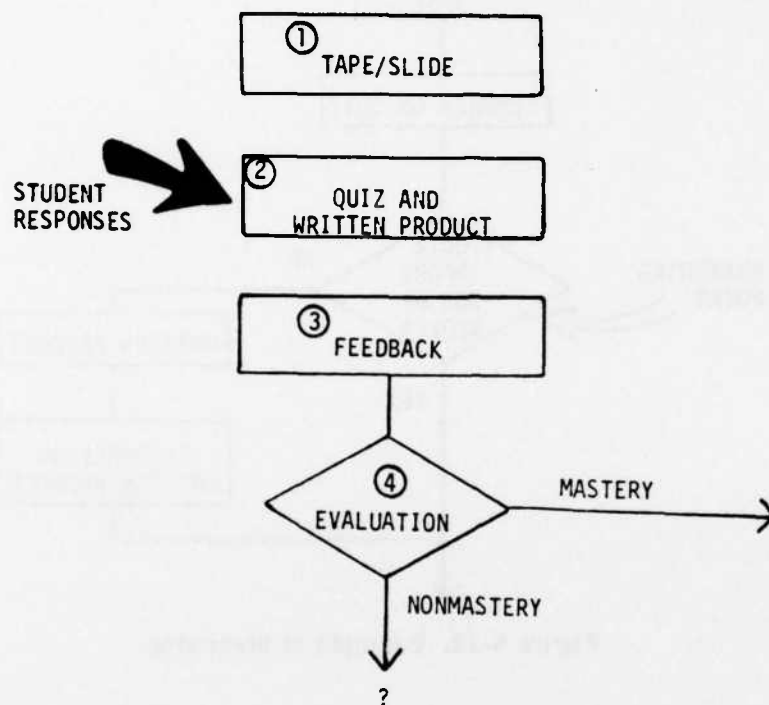
Figure 4-10. Two examples of student response.
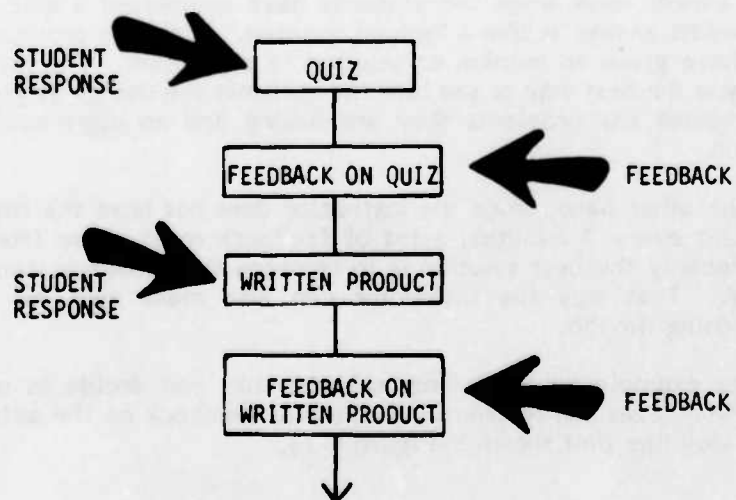
Figure 4-11. Feedback for each response.
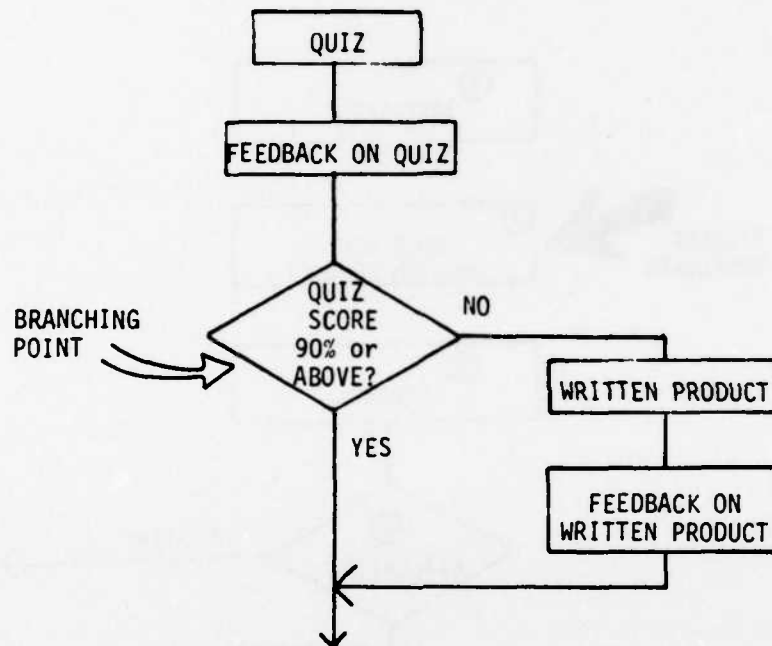
Figure 4-12. Example of branching.

There are three basic methods for providing feedback to your students:

1. Answer keys.
2. "Model" answers.
3. Instructor critique.

You can use answer keys when the students have completed a quiz or fill-in-the-blank exercise. A model answer is like a "school solution." You can provide a model answer if the students have given an opinion or solution to a problem. The instructor critique, of course, gives you the best way to see how the students are doing. It gives the instructor a chance to diagnose any problems they are having and an opportunity to motivate and encourage them.

On the other hand, since the instructor does not have the time to give feedback to every student every 5 minutes, a lot of feedback must come from the instructional materials. Probably the best solution is to combine the feedback from the materials and the instructor. That way the instructor can also make sure his or her instruction materials are doing the job.

In the example we are using, suppose that you decide to use answer keys for feedback on the quizzes and instructor critique as feedback on the written product. Your system would look like that shown in Figure 4-13.

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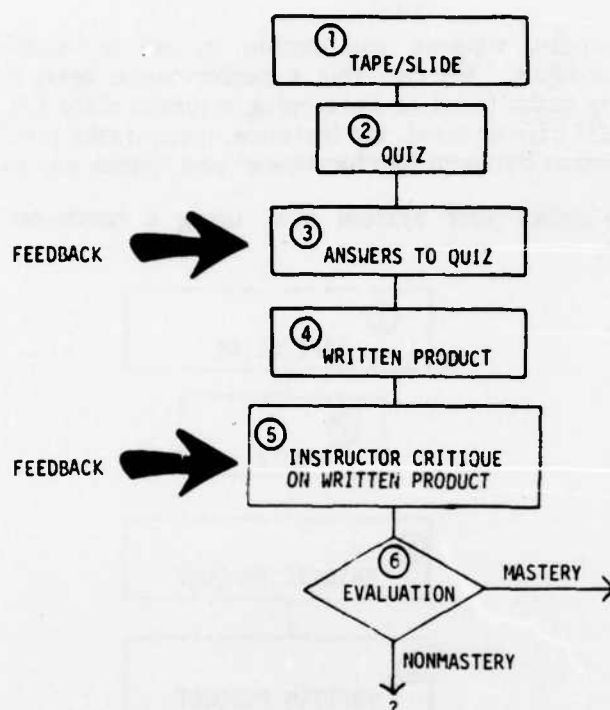
Figure 4-13. Two types of feedback.

4.6   Evaluation

How will you know if the student has mastered the lesson objective(s)? This is the critical point in a performance-based individualized instruction system. If you do not evaluate carefully, your system will not work. There are three decisions you have to make in evaluating students.

1.   What to cover. You or someone else must spell out exactly what students are supposed to learn before you can plan your tests. This should be done in well-written instructional objectives. If it is not, you will have to define the desired student performance before you develop the tests.

2.   How to sample. You may not be able to cover the entire performance. Suppose you want the students to be able to write a good plan for tasking artillery. How much of such a plan should they write? Should they write several plans? These are questions of sampling. Since you cannot always have students do everything, you may have to sample from all the possibilities. Ask yourself, "What are the critical points in the task?" Then, concentrate on those.

3.   What kind of test to use? The test you use--paper-and-pencil knowledge, hands-on performance, multiple-choice, or free response--depends on what you are trying to measure. You should consider the different possibilities before you start. The pros and cons of different types of tests are discussed later in this handbook. You can also learn more about this decision in the Instructional Quality Inventory: II. User's Manual (Ellis, Wulfeck, & Fredericks, 1979) and in the Handbook for Testing in Navy Schools (Ellis & Wulfeck, 1982).

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For our example, suppose you decide to use a hands-on performance test, producing a written product. We call this a performance test, even though paper and pencil are used. Many tasks (such as developing a lesson plan) are performed with paper and pencil. At the staff officer level, for instance, many tasks involve planning. There is not always a contradiction between "performance" and "paper and pencil."

Figure 4-14 shows your system now, using a hands-on performance test to evaluate performance.
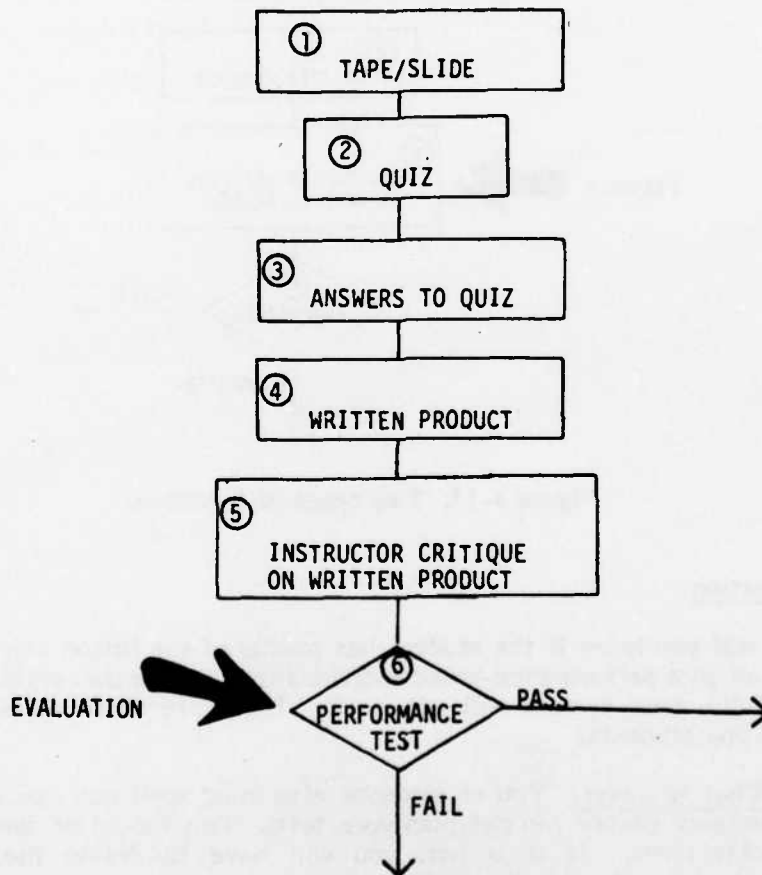
Figure 4-14. Evaluation component.

4.7   Additional Presentation/Response/Feedback/Test

Suppose the student passes the test. The instructor can review the test with the student and the student can move on to the next lesson or objective or, if this is the last lesson, to graduation!

Suppose, however, the student does not pass the test. What will your system do? We will see that this is where individualiztion really pays off.

Suppose you decided to use an alternate presentation method for students who fail to master the lesson test. Perhaps you can use a good programmed text that covers the same objectives. You could set up your individualized system so that students who

fail the lesson test study the programmed text. After that, they would retake the lesson test, as shown in Figure 4-15.
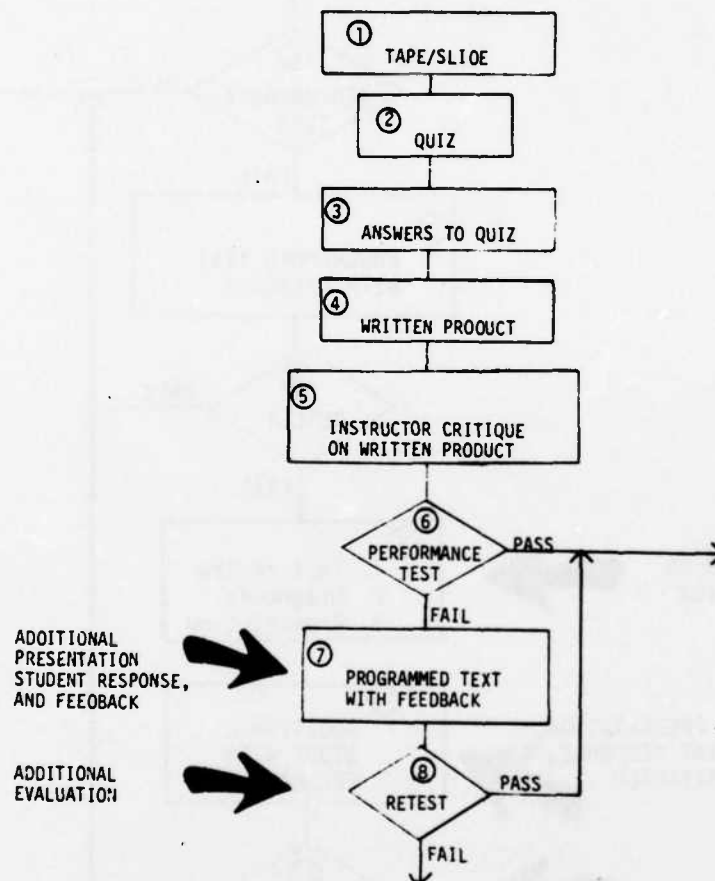
Figure 4-15. Additional instruction after failure to pass test.

If the student does not pass the test at this point, here are some of the possibilities that you could build into your system:

1. Restudy primary presentation (in this example, tape/slide).
2. Restudy secondary presentation (in this example, programmed text).
3. Schedule a one-to-one tutorial with instructor.
4. Provide a new method of instruction.
5. Schedule a one-to-one tutorial with another student.

Suppose that you provide an instructor tutoring session after the retest. At that time, the instructor could (1) review the student's test, (2) diagnose problems, and (3) prescribe additional restudy, as shown in Figure 4-16. In this example, the instructor assigns additional work to the student after the test review and diagnosis. After finishing this extra study, the student takes the lesson test for the third time.
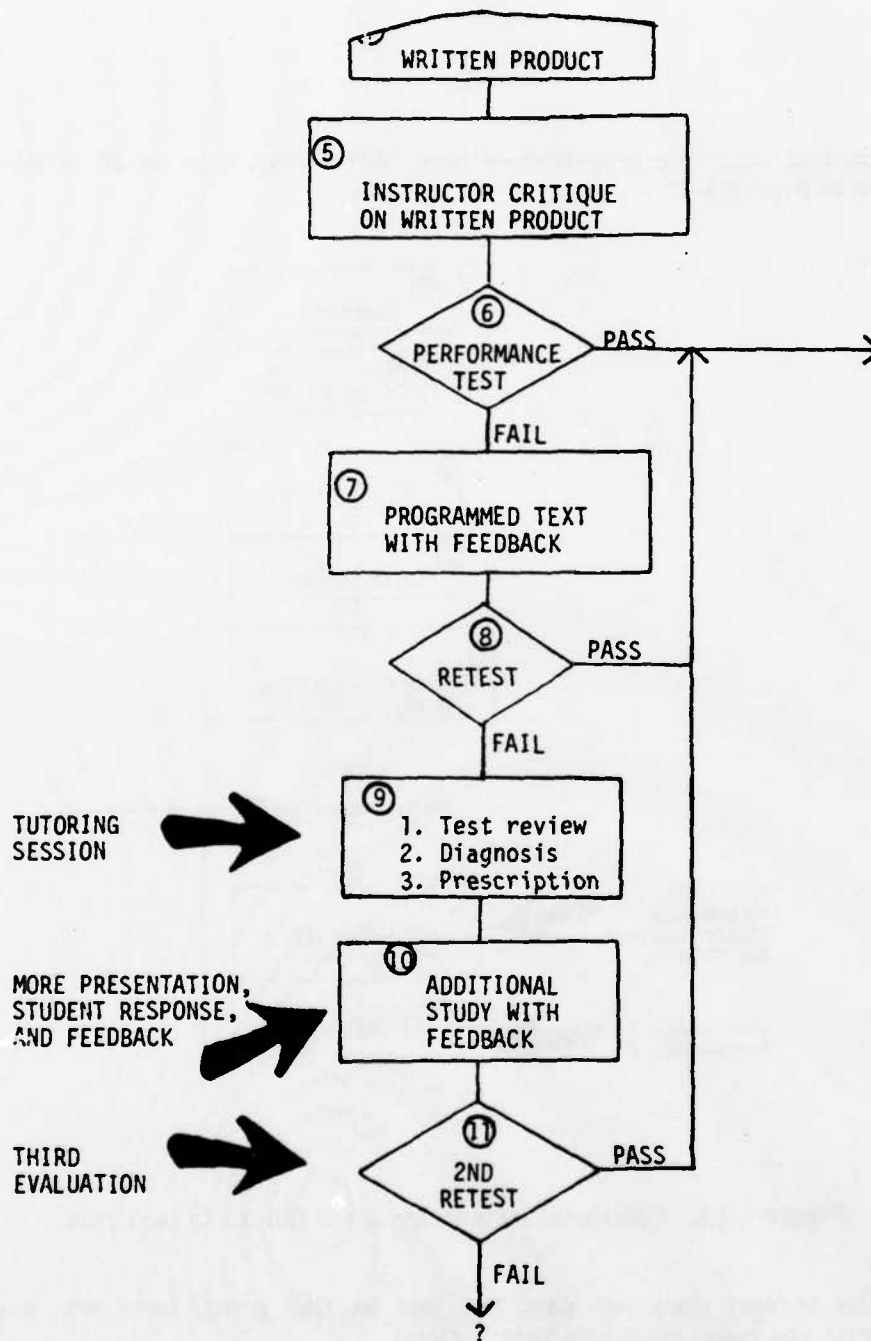
Figure 4-16. Additional instruction after second failure to pass test.

If the student still does not pass at this point, what will the system do? Some possibilities you could consider are:

1. Another instructor tutorial.
2. Restudy presentations.
3. Study new presentation (a little late for this, probably).
4. Move on to next lesson.
5. Instructor decision.

Remember, these are just a few possibilities. You can consider many other actions, too. The last item, instructor decision, means that the instructor has to decide what action to take. Be careful about putting a step like this into your system, because the instructor might be "swamped" with a lot of on-the-spot decisions. If, however, you think that few students will fail the lesson test three times, it may not be a problem.

4.8   Summary

You have just seen an example of how one individualized system could be built. To build your system, you should concentrate on the following general questions that we had to deal with along the way.

1. How will you present instruction initially?
2. How will you provide for the student's response?
3. How will you provide feedback to the student's response?
4. How will you evaluate the student?
5. If the student fails the first evaluation, what will you provide in the way of:
   a. Additional presentations?
   b. Additional student response?
   c. Additional feedback?
   d. Additional evaluation?
6. What will the system do if the student "never" passes the test?

After you have answered each one of these questions, you will be on your way to building a good individualized system. If you do not cover each of these questions ahead of time, your system may fall apart when students begin to go through it.

5.0   QUALITY CONTROL AND MANAGEMENT

Just to include presentations, feedback, etc., in your individualized system is not enough. Their quality is also important no matter if you convert an existing course or develop a new course. This chapter gives you guidance on how to control the quality of your system and how to set up a student management system.

In the last chapter, you saw how to build an individualized instruction system with presentations, student activities, feedback, and evaluation. That raises some big questions. How will you know what part of instruction the student is in? Is the student ready for a test? What is the student supposed to do next? How long has the student been working on a lesson? Unless you have quick answers to those questions, you will get confused. Your management system will be the key to keeping track of your students and their progress.

5.1   Quality Control

Everything in this section applies to both individualized and lock-step instruction. In either, the quality of the course is only as high as the quality of its parts.

The Navy Personnel Research and Development Center (NAVPERSRANDCEN) has developed guidelines you can use to control the quality of your instruction system. Detailed instructions for quality control of objectives, presentations, student response, feedback, and evaluation are in the Instructional Quality Inventory. II. User's Manual (Ellis, Wulfeck, & Fredricks, 1979). This section is based on the instructional quality inventory (IQI) procedures. We will look at objectives first.

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5.1.1 Are Your Objectives Correctly Stated?

An objective serves two purposes. It tells the students what they are supposed to learn and it tells the instructors what they are supposed to teach.

Telling students what to learn is a powerful tool--maybe too powerful. If students know what to learn, maybe they will learn it alone without the instructor. Some instructors see this as a threat. They do not want to tell students what to learn, because they do not want to lose control of the class. Keeping students in the dark is a good way to keep control, but it does not help them to learn.

Telling instructors what to teach is a powerful tool, too. Stating objectives of instruction helps keep the instructor "on track," which is important no matter what method the instructor is using (lesson plan, self-paced lesson, video script, or whatever).

A big problem with objectives is that people think they are easy to state. However, if you have ever tried to define what your students should be able to do, you know that developing objectives is difficult; sometimes it takes many attempts to be able to state what you think is obvious. Developing objectives is taught in Marine Corps Order 1553.1, in Interservice Procedures for Instructional Systems Development (NAVEDTRA 106A), and in the IMS lesson on developing objectives.

Every objective should include a behavior (action), conditions, and a standard. If any one of these is missing for objectives in your course, you will have to fix them. In the following objective, the conditions are missing: "At the end of instruction, debug a computer program within 4 hours." "At the end of instruction" is not condition. It does not tell the student what kind of program will be debugged nor what references to use. It does not tell the instructor enough to develop the instruction. You would have to rewrite the objective before developing your instruction.

What do you think of the following objective? "Without the aid of references, describe the philosophy of a force of combined arms." It has no standard. How will you know whether the student has succeeded? How "good" does the description have to be? How much and what level of detail are required? As the objective does not say, you would have to rewrite it.

When you individualize a course, make sure that each objective has the three essential parts: action, conditions, and standard. Also make sure the action is observable and measurable.

5.1.2 Are Your Presentations Effective?

The IQI gives the following three rules for making your presentations effective:

1. Separate important points from the rest of the text (or lecture, or audiovisual lesson).

2. Identify important points as such.

3. Provide some "help" to remember the point.

Let us see how these rules could be put into practice.

1. Separate important points. There are lots of ways to separate important points. We just indented the three IQI rules. Besides indenting, there are other ways to

separate important points such as use color, use a box, change to a different TYPE FACE, or put a special point on a completely different page. In an audiovisual lesson, you can pause before giving the statement to catch the listener's attention.

2. **Identify important points as such.** The IQI lists the following labels for use in identifying important points you want the students to remember:

    a. Key point.
    b. Rule.
    c. Definition.
    d. Procedure for_____.
    e. Principle of_____.
    f. Main idea.

You can think of other labels that match the content of your own course. Here is an example of an important statement separated and labeled:

> KEY POINT. An objective
> has three parts: (1) action,
> (2) conditions, and (3) standard.

3. **Provide help.** When you present an important point that the student must memorize, include something to help the student understand and remember it. Here are some suggestions from the IQI:

    a. Provide a memory trick (mnemonic).
    b. Give an example.
    c. Explain why the point is important.
    d. Relate the point to something else.
    e. Explain some of its terms.
    f. Illustrate the point (symbol, table, flowchart, etc.).

For example, a common memory trick or mnemonic is used to remember the lines of a staff in writing music: "Every Good Boy Does Fine" (EGBDF). Another memory trick is used in biology to remember the divisions of the natural world: "King Phillip, Come Out For Gosh Sakes" (Kingdom, Phylum, Class, Order, Family, Genus, Species). In the military, many memory tricks are used to remember concepts and principles. If you are presenting a new concept, you could make up your own mnemonic to make it easier to remember.

Are your presentations of content effective? Remember these three ways to make them adequate.

1. Separate important points.
2. Identify important points.
3. Provide help.

5.1.3   Are Your Examples Adequate?

Adequate presentations need adequate examples. When you give examples, the IQI says to follow these rules:

1. Examples must be separated and identified.

2. Examples must include some type of help.
3. Examples should range from easy to hard.
4. Examples should represent the job the student will do after training.
5. There should be enough examples to cover the content area adequately.
6. Examples should show clearly why common errors are wrong.

As you can see, the first two rules for examples are the same as the rules for presentations. Separate and identify them. Provide some help in understanding them.

Help (Rule 2) is included in different ways for different situations. Read the IQI manual to see how to give help for categories, procedures, and principles and for more complete guidance.

5.1.4 Are Your Practice Items Adequate?

Active student response--usually practice--should be part of your instruction system. To control the quality of your system, the IQI gives these rules for practice items:

1. The practice section must be separate and identified.

2. The practice items must be free of hints that will not be present in the test or on the job.

3. The format of the practice and test items should be the same.

4. The practice items should range from easy to hard.

5. The practice items should be typical of the job to be performed after training.

6. The practice items should include the opportunity for common errors.

7. The practice item must be followed by feedback.

These rules are self-explanatory; read the IQI manual to learn more. The last item listed, feedback, brings us to our next quality-control question.

5.1.5 Are Your Feedback Items Adequate?

Sometimes you give the answers (feedback) to practice questions in the back of a test, workbook, or study guide. You can also give them right along with the presentation. When you do this, the IQI says to observe these rules:

1. The feedback must also be separated and identified for each practice item.

2. The feedback should include help (similar to that for examples).

5.1.6 Are Your Test Items Adequate?

The IQI manual also gives some rules to observe when you construct or check the quality of test items. Be sure that:

1. The item is clear and not ambiguous.

2.   The item does not give away its own answer--or the answer to any other item.

3.   The item is well constructed.

The word "ambiguous," used in Rule 1, comes from two Latin words meaning "both ways" and "lead." In other words, to lead both ways at once, or aimlessly, which is the worst kind of leading. That is what a test item will do if you are not careful. It can lead the student on a wild goose chase. Here is an example of poor directions: "Which of the following is able to provide close air support?" That is ambiguous, because the student is not told whether to pick one answer or all the answers that apply. It would be better to say, "Select the one weapon system best able to provide close air support."

Rules 2 and 3 are self-explanatory, but not always easy to achieve. To make sure that none of your test items gives away its answer, let someone else look at your test. Someone else will see your mistakes better than you can. Tell your "critic" to look especially for items where the answers can be figured out from the test itself.

5.1.7   Are the Parts of Your Instruction Consistent?

So far, we have dealt with the adequacy of objectives, presentations, examples, practice, feedback, and tests. Another part of quality control is consistency. Read the IQI manual to learn how to make the following "big three" consistent with each other:

1.   Objectives.
2.   Tests.
3.   Presentations.

In other words, test items should be consistent with objectives and presentations should be consistent with both objectives and test items.

Consistency means two things. For example, a test item is consistent with an objective if (1) the learning task performed for the test item is the same as the task stated in the objective and (2) the type of content the student must learn for the test item is the same as the type of content in the objective.

The IQI manual shows how to determine the learning task and the type of content. One type of task is "remember" and one type of content is "fact." When you put these two together, you obtain "remember fact." This means that, if the objective is to remember a fact, then the test item should require the student to remember a fact and the presentation should teach how to remember the fact.

Figure 5-1 shows the entire IQI classification scheme, which has five types of content and three tasks. Notice that you can perform only one task (remember) with bare facts. You cannot use a fact by itself. Facts are usable only when they are linked with other facts in a category, procedure, rule, or principle.

Why is it so important to be consistent? If the presentation prepares the student to do one thing and you test the student on something else, you will not get good results. Suppose your objective is for the student to use a procedure, your presentation teaches the student to remember a fact, and you test the student on using a principle. How well do you think the student will perform?

	FACT	CATEGORY	PROCEDURE	RULE	PRINCIPLE
REMEMBER – Recall or recognize					
USE-UNAIDED – With no aids except memory					
USE-AIDED – Job Aids are available					

Figure 5-1. IQI classification table.

5.1.8   Obtaining the IQI

If you do not already have the four volumes of the IQI, contact the Defense Technical Information Center, Cameron Station, Alexandria, VA 22314 (Telephone: 284-7633 (Autovon) or (202) 274-7633 (Commercial).   AD numbers are provided in the reference list.

5.2   Management

Individualized courses need more management control than do lock-step courses. (In a lock-step course, management is pretty simple because everybody does the same thing at the same time.)   Some of the questions you will need to answer to manage individualization are:

1. How will students know what to do next?
2. How will their progress be controlled?
3. How many retests will be allowed?
4. How much time is allowed to complete a lesson?

Other questions--that you never thought of--will come up in the first few weeks of your individualized course. To deal with them all, do these two things: (1) Write down a rule for each decision that you make and (2) print a student progress card that shows how the rules apply. Examples are provided below.

1. If you decide that the passing score will be 90 percent for lesson tests, you could show that right on the student progress card. For most rules, it can show the instructor what will happen next. Figure 5-2, which is part of a student progress card, shows what will happen after a student takes the lesson test for the first time. Notice how the passing test score (90-100%) is printed right on the card. What will happen if the student scores less than 90 percent is shown on the card, too: (a) The instructor reviews the student's test and (b) assigns exercises #50 through #100.

With a card like this, the Instructor knows Instantly what all students should do next. This is important, since you do not want to waste the instructor's time with small on-the-spot decisions. You want the Instructor to be guiding, motivating, tutoring, and giving feedback to students.
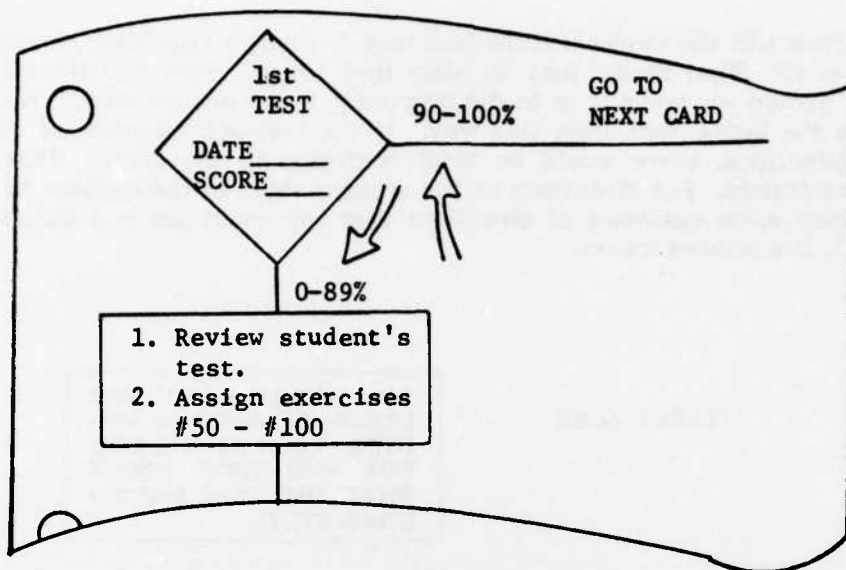
Figure 5-2. Showing passing score on student progress card.

2. Suppose you decided that a student should be able to complete exercises #50 through #100 in half a day. That is, if the student takes longer than that, there may be a problem. You cannot expect the instructor to remember when the half day is up. It would never work. An instructor would have a hard time memorizing a dozen different times to check on students' progress.

A better way is to leave space to enter the start and estimated completion times right on the student progress card (see Figure 5-3). The EST. FINISH time says 1430 instead of 1330 to leave time for lunch, of course. Now all the instructor has to do is look every half hour or so at the student control cards and at the clock to see whether the students are on time or behind schedule. Of course, this is just an example. For your own course, you would probably do it a little differently.

Figure 5-3. Entering start and estimated finish times on student progress card.

Both of these examples were concerned with one part of the management problem; namely, how will the instructor know what to do? The other half of the management problem is how will the students know what to do? Let us look at it.

How will the students know how long to study a tape/slide lesson? Can they spend all day at it? What should they do when they finish? How will the students know these things? Should you leave it up to the instructor to put out the word? No, you do not want to waste the instructor's time this way. If the instructor spends all of his or her time giving directions, there would be total confusion in the class. That leaves the instructional materials. Put directions to the student right in the content of the lesson. Figure 5-4 shows some examples of directions that you could put in a tape/slide lesson, and Figure 5-5, in a printed lesson.

"EARLY" SLIDE

> YOU SHOULD FINISH THIS LESSON IN ABOUT 40 MIN- UTES. LOOK AT THE TIME NOW AND THINK ABOUT WHAT TIME YOU SHOULD COMPLETE IT.

"MIDDLE" SLIDE

> THIS LESSON IS AOBUT HALF OVER. YOU SHOULD COMPLETE IT IN ABOUT 20 MINUTES.

"ENDING" SLIDE

> YOU HAVE FINISHED LES- SON 4202. NOW TELL YOUR INSTRUCTOR YOU ARE READY FOR THE LES- SON TEST.

Figure 5-4.   Examples of directions to the student in an audiovisual lesson.

> Here's what to do:
> 1.   Read the lesson objective and the JPAs.
> 2.   If you then feel you are ready to be tested, ask an instructor for the lesson test.
> 3.   If not, study the lesson, the required resources, and any additional resources that you wish.
> 4.   When you are ready to be tested, tell an instructor.

> Are you ready for the lesson test? The test will require you to fill in a validation "Observation Log" based on a description of students' actions and comments during validation of a lesson.
> When you are ready to be tested, see an instructor.

> Here's what to do:
> 1.   Read Preparing Instructional Objectives.
> 2.   Review ITV tape "Objectives."
> 3.   Read the lesson Overview and the Job Performance Aid.
> 4.   If you feel you are able to demonstrate mastery of the lesson objectives and you wish to take the lesson test without studying further, tell an instructor that you are ready to be tested.
> 5.   Otherwise, study the lesson and any additional re- sources that you wish.
> 6.   When you are ready to be tested, tell an instructor.

Figure 5-5.   Examples of directions to the student in a printed lesson.

5.3 Management Records

In the last section, we discussed using a student progress card. You need a progress card or something like it to know where your students are and what they should do next. In this section, we will look at examples of student progress cards and other management records.

Figure 5-6 is a control card for a worksheet system for one lesson or module. Each time the student starts another module, you would add another card.
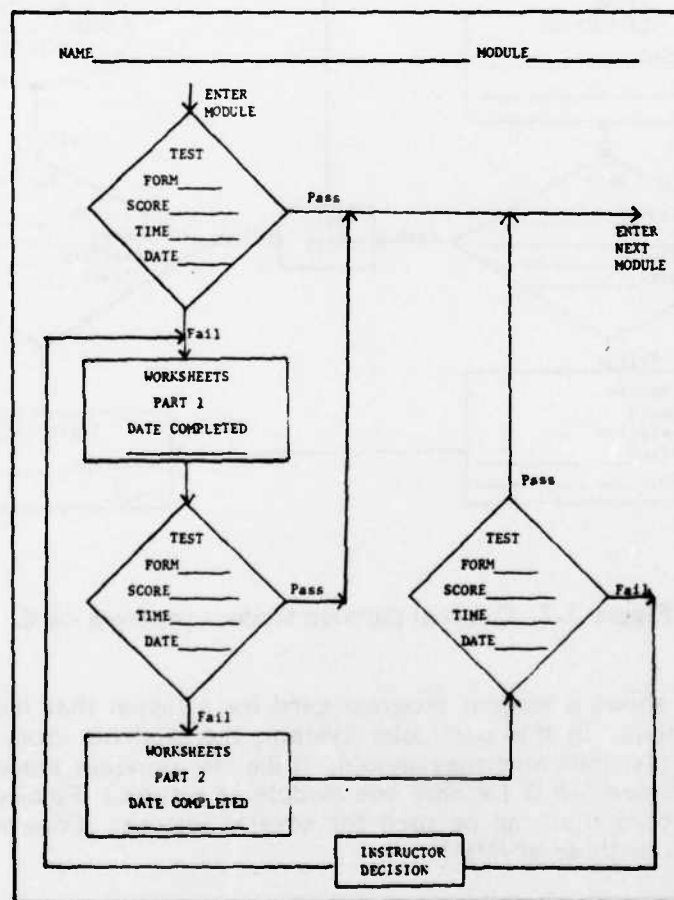
Figure 5-6. Student progress card for the worksheet system.

The general purpose student progress card shown in Figure 5-7 could be used for any instruction system that used several tests with instruction between retests. It includes a "test review" to cover any errors the student made, even if the student passes the test.

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NAME _____   LESSON _____
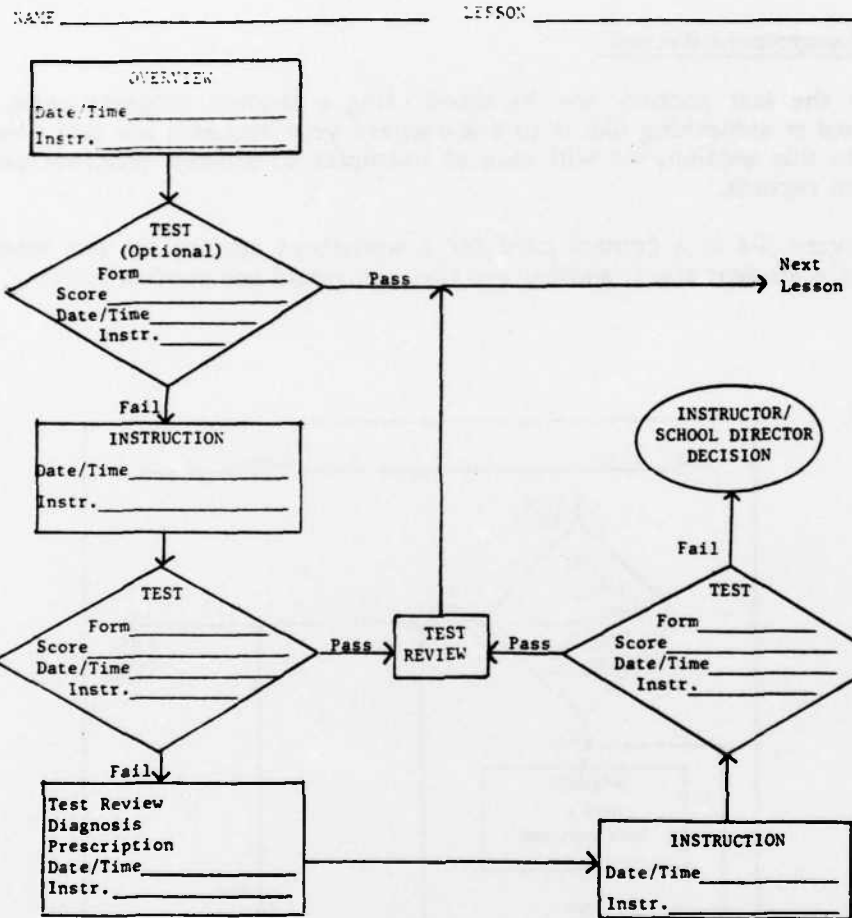
Figure 5-7. General purpose student progress card.

Figure 5-8 shows a student progress card for a lesson that includes a diagnostic test before instruction. In this particular system, the students study only the lesson(s) that the diagnostic test indicates they should. (Like the previous student progress cards, the card shown in Figure 5-8 is for only one module at a time.) Finally, Figure 5-9 shows a student progress card that can be used for several lessons. (You may recognize the names of the lessons as those at IMS.)

Remember, these are just examples. In your own course, you would do things your way. A sample student progress card is provided on p. C-1 for you to use with or without revisions in your course. The important thing is to "cover" all the times when the instructor or the student has to know what to do. Do not leave it to the instructor to figure out on the spot.

It is impossible to think beforehand of all the questions you will need to answer. Just to get you started, Figure 5-10 lists some of the questions you must answer to manage your course. For each item, we have shown where you need to provide instruction. The individualization system checklist is provided on p. C-2 for you to use when you individualize your course.
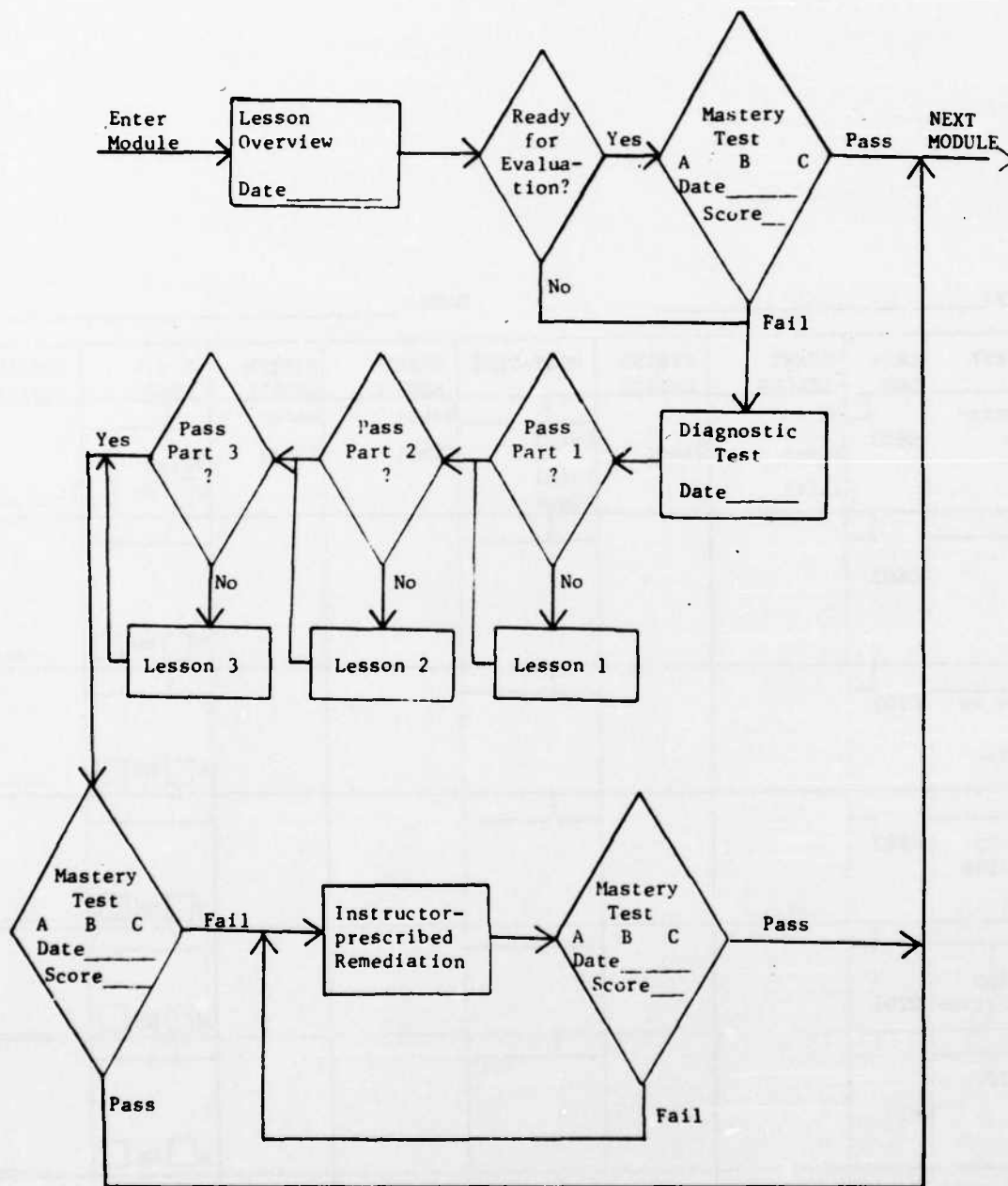
Figure 5-8. Student progress card for lesson with diagnostic test.

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Entry: _____   NAME: _____

PRETEST	LES-SON	START LESSON	FINISH LESSON	POST-TEST	START ADDT'L	FINISH ADDT'L	POST-TEST	INSTRUCTOR DECISION
Orienta-tion	0601	Date: Time: Init:	Time:	Date: Total Time:	Date: Time:	Date: Time:	Total M☐ NM☐	I: _____
ISD	0602						M☐ NM☐	_____
Intro to Job Descrip-tion	0101						M☐ NM☐	_____
Mastery Teaching	0603						M☐ NM☐	_____
I Develop Objectives	0201						M☐ NM☐	_____
II							M☐ NM☐	_____

NOTE: M = Mastery   NM = Nonmastery

Figure 5-9. Student progress card for several lessons.

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Questions/Decisions	Tell Instructor On Control Card	Tell Student in Lesson
1. How will student know how to get started?		X
2. How will students know what to do next?		X
3. How will student know lesson objectives?		X
4. Can students skip the lesson pretest?	X	X
5. Can students "challenge" the lesson test?	X	X
6. How will the student know if he or she is ready for the lesson test?		X
7. How will the instructor know if the student is ready for the lesson test?		X
8. How long can a student spend on a particular test?	X	X
9. Is there a minimum time to spend studying between test and retest?	X	X
10. How long may a student spend on a particular lesson?	X	X
11. What is the criterion for passing a lesson?	X	X
12. How will the instructor know where the student is located in the program?	X	
13. What will the instructor do if a student is too slow?	X	
14. What will the instructor do if a student has "free time?"	X	
15. How will the instructor know that a student needs extra help?	X	
16. How will the student know he or she needs extra help?		X
17. How will the student get extra help?		X
18. How long can a student take to complete the course?	X	X
19. What is the criterion for passing the course?	X	X

Figure 5-10. Course management decisions.

You will need other course records, too; for example, you need a way to see at once where all your students are. (So you can tell if you need seats for more students, for instance.) Figure 5-11 is an example of a wall chart showing the status of a whole class. To make a chart like this, you could use a chalkboard, magnetic board, or just some cardboard on a wall. Look on the chart and notice these things:

1. Allen is behind schedule. He should have finished lesson #5 by now (his eighth day).

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2. Smith is behind schedule, too. She should have finished lesson #1 by now (her second day).

3. All others are on schedule or ahead of schedule.
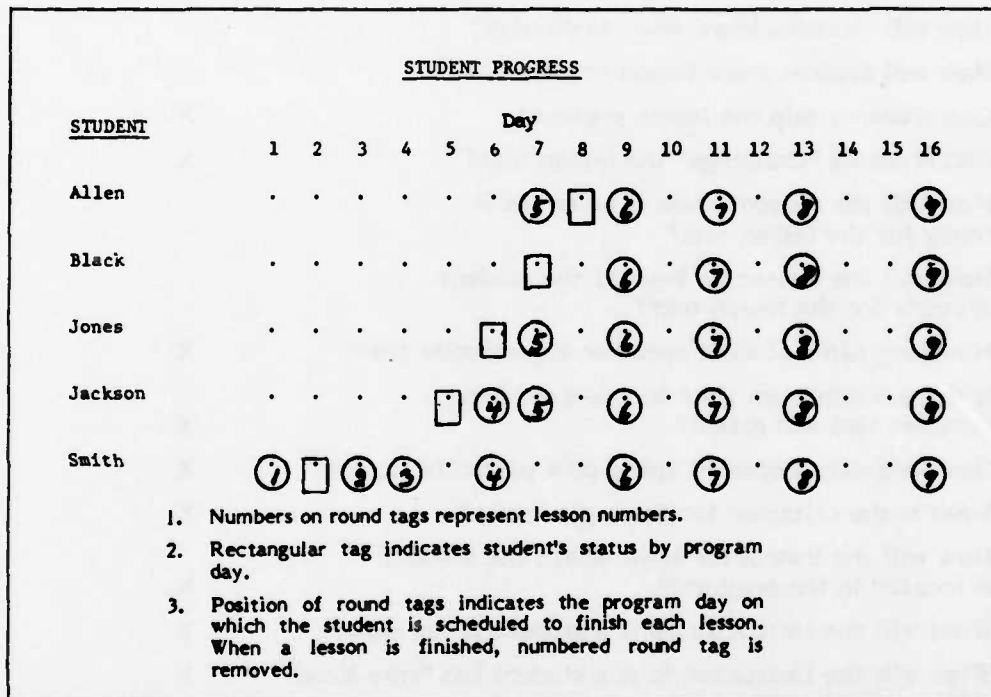
Figure 5-11. Example of wall chart showing status of entire class.

Remember, these are only examples of management records. You do not have to use these exact forms in your own course, but can design your own progress cards and control chart. The same information is needed, no matter what you teach: (1) where the student is and (2) what the student should do next.

5.4   Scheduling

One problem that comes up in individualized instruction is how to schedule group activities. Can you present a guest speaker or hold a group discussion within individualized instruction? You can by reserving a block of time. For instance, you could hold open the time from 1300 to 1500 every Wednesday. Students would know in advance that they are meeting as a group at that time. You could hold open as much time as necessary this way. In one Air Force program, for example, the class day is almost evenly divided between group and individualized instruction. The way you set up your schedule is up to you.

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5.5   Summary

Quality control and course management are even more important in individualized instruction than in traditional instruction. In a lock-step system, the platform instructor can "fine-tune" the course as he or she goes along. This is more difficult in an individualized instruction system.

You need to pay close attention to the effectiveness of your instruction and prepare carefully. Take the time to ask yourself all the questions we have asked in this chapter about how the system will run. Once it starts running, it will be a little late to start thinking about how students will progress.

Write down each management decision, such as how long a student will have to complete the course. Then act on these decisions by putting student directions right into the instruction. Put rules that the instructor should follow right into the student progress card. Then the instructor will not have too many decisions to make at one time.

After your individualized course has been in operation several weeks, you will probably want to make some changes. You may go through several "editions" of student progress cards and schedules before you get what you need. The same is true for scheduling.

As you must start with some rules to keep from getting lost, set up rules for guiding students through the course. You can change these rules later if needed.

6.0   THE ROLE OF EVALUATION

There are actually many reasons to evaluate individuals. You are probably reading this text to learn about evaluating students in a classroom. The most common reason is probably to see if a student has gained the skills and knowledge you are teaching; in other words, to see if the objectives of the training have been met. Another reason is remediation--to see which skills and knowledge the student still needs to acquire. Third, you might evaluate persons to qualify them for promotion, special assignments, proficiency pay, etc. Fourth, individuals might also be evaluated to estimate the combat readiness of a whole unit. For example, the proportion of Marines who can perform certain tasks is one indicator of the readiness of a Marine unit as a whole and the percentage of vehicles that are ready to roll is another.

Although this instructional package is aimed at evaluating students in training, the same principles apply to all evaluations. Therefore, if you are going to build performance tests for the field, the following chapters on evaluation should also be helpful for you.

1. _Evaluation and individualization._ Individualization, as you have seen, calls for lots of testing. You need to know how each student is doing to fit your instruction to that student, especially when you are trying to get each student to the same level of mastery. If you do not evaluate, you do not know if the student has reached mastery.

In your individualized system, the purpose of evaluation is to affect the student's performance, not merely to find who is the best in the class. To affect the student performance, evaluation must meet these standards:

a. It must tell the instructor how the student is doing.

b. It must tell the student how he or she is doing.
c. Its results must be available fast.

As the results of evaluation control what the student does next, they must be available now, not tomorrow. Also, both the instructor and the student must know what the test results mean.

Compare the role of testing in a typical high school course to the role of testing in the individualized IMS course. In a high school course, if you take a test on Tuesday, you get your grade on Wednesday or Thursday. In the meantime, the course rolls on to the next topic. At IMS, however, you get your test results much sooner and you do not go on to the next topic until you pass the test.

2. <u>Decisions in testing</u>. Usually, a test cannot cover all the elements of training or job performance. The number of things you might measure is usually many times the number of things you can measure. Therefore, you have to decide such questions as:

a. What should be tested?
b. How much should be tested?
c. What kind of test should be used?
d. Does the test measure what it should?

Making decisions about such questions is what evaluation is all about.

3. <u>Test development</u>. The development of a test consists of three major activities: (a) planning the test, (b) constructing the test, and (c) tryout/revision. Planning the test, the most critical step of the three, will be discussed in Chapter 7. Chapter 8 deals with test construction, and Chapter 9 provides guidance on trying your test out and revising it.

7.0 PLANNING A TEST

Planning a test involves three major decisions. The first is what to test. Before you begin, you have to get a very clear picture in your mind of what you are trying to measure (this is not always easy). Second, you have to decide how to sample. Sometimes you cannot test everything you want to and you have to choose certain areas. Third, you have to decide the form of test to use. This choice will depend a lot on what you are measuring. You might use a different form of test to learn how well a student performs a procedure than to test a problem-solving skill.

7.1 <u>What to Cover (The Domain)</u>

Whatever your reason for evaluating individuals, you first have to define what is to be evaluated. The most important requirement for good evaluation is a clear, precise definition of the areas of achievement to be measured. For example, to evaluate students or trainees either the objectives or the content of training must be spelled out. To evaluate job performers, the acts that make up correct job performance must be carefully stated beforehand.

The specification of what is to be evaluated is called the performance domain by psychologists. Ideally, if the performance domain is well defined, two different test developers--working separately--would come up with similar tests. That would also depend on other things such as agreeing on initial test specifications. The point is you cannot evaluate something unless you know what it is. (You cannot get much use out of test results either, if you do not know how they were obtained.)

To select the right content domain, stop and think about the purpose of your test. To measure student achievement, the training objectives will be your content domain. If objectives are nonexistent or inadequate, you should review the training content to define clear objectives. (The content of training may be in many forms; for example, lesson plans, lecture notes, handouts, audiovisual materials, texts.)

To measure job performance--not training performance--job performance is your domain. Job performance would have to be spelled out in terms of tasks or some other statement of job requirements.

Sometimes you cannot measure what you want. Maybe it costs too much or measurement is unreliable. A good example is something like "positive attitude." This trait would be great to know about when promoting someone, but there is no reliable way to measure it or even define it. Another example is "total job proficiency." Although it would be great to know an individual's total job proficiency, it is impossible. It would cost far too much to test an individual on every single thing he or she ever does on the job.

When you cannot measure the domain that you want, you measure what you think is closest to the domain you want. In the case of "total job proficiency," you can measure part of an individual's job proficiency or job knowledge. (Job knowledge is not proficiency, but it is close to it. You cannot do something if you do not know how.) Knowledge takes less time to measure. When the domain you are interested in is too costly to measure, you have to consider the pros and cons of such "intermediate" measures as sampling the domain.

7.2   Sampling Strategy

Whatever content domain you define, it will probably have more elements than you can measure. Possible units of test performance include all elements that you could identify in a close look at the content. Since training and job domains consist of so many elements, all of them cannot be represented on tests.

What will you do? The answer is sampling. Before you build a test, you decide how to sample the elements in your content domain. Before we discuss different ways to do this, let us consider the idea behind sampling.

Consider sampling drinking water for purity. When an inspector takes a sample of water for testing, is the inspector interested in the sample in hand? No. When a doctor takes a blood test, is the doctor interested in the blood taken from your arm? No, of course not. The water taken for sampling will never be drunk and the blood taken from your arm is never going back into you. The inspector, or the doctor, is interested in what is left--all the water in the total water supply or all the blood in your body. When you take a sample of something, you are interested in the larger thing you took the sample from, not in the sample itself.

If a sample of water from a water supply is pure enough to drink, we conclude that the whole water supply is pure enough. If a sample of blood from your body is type O positive, we conclude that all your blood is type O positive, not just the blood in the sample. Once you think about this, it is obvious. Nobody gets confused about sampling water, because water is mixed very well. The water in the top of a water tank is about like the water at the bottom.

People do get confused about evaluating performance. They forget that almost nothing can be evaluated completely. They forget that evaluation involves sampling.

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When you build a test, you are interested in performance beyond the test--not just about what is on the test itself. Consider the whole domain you are trying to measure. When you sample, you want to select elements for your test that enable you to generalize from performance on the test to performance in the whole domain.

What elements will you include on your test? What elements will best represent the whole domain? How will you pick them? Your sampling strategy consists of the answers to these questions. There are many possible sampling strategies you could use. In this section, we will discuss these five:

1. Random sampling.
2. Generality of content.
3. Frequency.
4. Performance characteristics.
5. Criticality.

7.2.1   Random Sampling

Selecting elements from the domain at random is often very reasonable. This strategy makes no assumptions other than that each element has an equal chance of being selected. It does not depend on knowing the characteristics of the elements in the domain. Its main disadvantage is that it lacks "power." It does not take advantage of any information about the characteristics or relationships among elements in the domain and these might be important for your purpose. Often you can improve on random sampling by classifying the elements of the domain using one of the strategies described below.

7.2.2   Generality of Content

When commonalities among domain elements can be identified, they can form the basis for sampling in terms of the generality of content. Suppose you know that information about the layout of electronic components is necessary both for operating and repairing a piece of equipment. Then, that information has greater generality than information needed for repair work alone. If you can classify the kinds of behavior underlying job performance, you can sample on the basis of generality.

Unfortunately, as no complete classification of the demands of jobs exists, sampling based on generality must be based on judgments about commonalities and dependencies. Where such relationships do not exist or have not been identified, you may want to use other characteristics of the domain elements as a basis for sampling.

7.2.3   Frequency

Sampling the content domain on the basis of frequency can often be done fairly easily. How often different tasks are performed in a job can usually be determined from records of equipment malfunction, recollections of job incumbents, occupational surveys, etc. The only trouble with using frequency as a basis for sampling is that you cannot always tell what it means. For example, is frequently or infrequently used content more important? Tasks that are frequently performed are, obviously, important to the job. You can argue that frequent tasks should be given greater representation in a job proficiency test. On the other hand, because frequently performed tasks are practiced more, there is more chance that a person can do them. Therefore, it could be argued that infrequently performed tasks should be given priority. In this situation, the choice comes down to judgment, which involves other factors such as the criticality of the task to the mission.

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7.2.4   Performance Characteristics

Other bases for sampling the content domain are characteristics like difficulty of performance, difficulty of learning, and variability of performance. Although this information comes from records of success and failure during performance, such records are often not available. In fact, you may be developing your test to get such information. When you do not have data, you will base your judgments on estimates from persons on the job. In those cases, the standard for judging difficulty may present a problem, because it may be hard to get agreement about the meaning of the term "difficulty."

7.2.5   Criticality

Another basis for determining the most important elements in the content domain is criticality. Criticality for what purpose? For example, job content might be evaluated in terms of its contribution to (1) task completion, (2) the neutralization of different types of targets, (3) mission accomplishment, or (4) battlefield survival.

7.3   Executing Your Sampling Plan

When you have picked one basis or more for sampling from the content domain, sampling can begin. No single approach will fit all situations. If you have selected a single basis for sampling, like frequency of use, you may only have to list all the elements of the domain on the basis you have picked.

Example: If ten tasks from a job performance domain are to be selected, you might choose the ten most frequently performed tasks or decide to include some less frequently performed tasks of lower frequency. If so, one approach often used is to classify the tasks into several lists. You could select a group of frequently performed tasks and a group of tasks that fall in the middle of the range. Then, you could weight the representation of tasks from the different classification, such as six high-frequency tasks, three middle-frequency tasks, and one low-frequency task.

Perhaps you have defined two or more sampling variables, like frequency and criticality. In that case, it is often convenient to set up a sampling table or matrix. First, you classify the tasks. Then, you display them in a table, perhaps in three groups, as in the last example. The ten from the high-frequency group with the highest criticalities can then be selected.

7.4   Form of the Test

The form your test will take depends a lot on what you are trying to measure. You have to consider the content of the performance domain. As you remember, the performance domain might be training objectives, training content, job performance requirements, or some other well-defined content. It is very important that the content of the performance domain be clearly defined. Some of the possible forms your test might take are:

1.   Performance of a complete unit of work.
2.   Display of particular skill(s) required for unit(s) of work.
3.   Display of particular knowledge required for unit(s) of work.

By performance of a complete unit of work, we mean a task or job activity more or less as it would occur in the field. Examples of a particular skill are deciphering code

and reading a compass. Displays of knowledge might include outlining the organization of division artillery, designating a good amphibious task force objective, or developing an electronic warfare plan.

To decide which test form or combination of forms is best for your purpose, sort the content of your performance domain in terms of four questions:

1. <u>Does the domain contain motor skill and/or perceptual skill?</u> Motor/perceptual skill is sometimes called just "skill." We are all familiar with this kind of skill: Ride a bicycle. Shoot a bull's-eye with a pistol. Guide a TOW missile. Steer a truck cross-country. Weld a seam. All these activities require physical coordination, usually hand-to-eye coordination.

2. <u>Does the domain contain direct application of procedures?</u> A simple example of a procedure is disassemblying a weapon, which is usually a 1-2-3 series of steps. Not all procedures, however, involve hardware. Cashing a check and preparing a property receipt are procedures. When we say direct application of a procedure, we mean following each step exactly as spelled out.

3. <u>Does the domain contain application of rules or principles?</u> When you apply a rule or principle, you are using general guidance to do something specific. You are not just following a series of steps that have been laid out for you. A good example is target selection. There are many general rules about what kinds of targets have priority that you have to apply. Two officers might even disagree about which targets to attack first, because most rules allow some variation in application.

4. <u>Does the domain contain problem solving, troubleshooting, or decision making?</u> In these kinds of performances, you often have to figure out the rules yourself because there is not necessarily a general rule to guide you. To reach a decision, you often have to figure the pros and cons of the choice facing you.

To decide what form(s) of test to use, examine your content domain for each of these four kinds of performance. Of course, you might find out that you have all four. If your domain is training objectives, for example, you may find objectives of all four types.

Naturally, you have to consider practical restrictions, too. Administering hands-on performance tests, for example, takes a lot of time and personnel. Sometimes you do not have the equipment needed for the best form of test. However, considering the kinds of performance in the content domain is the place to start. That tells you, at least, what test formats can be used. Let us see how these four kinds of performance are related to different forms of tests.

7.4.1 <u>Motor and/or Perceptual Skill</u>

A good way to tell whether behavior is skilled or nonskilled is to judge whether or not practice is necessary before the act can be performed. This includes acts that (1) are hard to describe, like a golf swing, (2) are learned in stages, like Morse code, and (3) involve timing or coordination, like tracking a moving target. Performance that cannot be produced just by telling or showing someone what to do can be considered skilled.

If the training or job performance to be tested involves motor or perceptual skill, then a hands-on (performance) test is needed. You could test complete units of activity like placing an underwater demolition charge, elements of required skill like swimming or welding, or elements of required knowledge like reading a multimeter.

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7.4.2   Direct Application of Procedures

The type of training or job performance that is most suitable for all forms of testing is the direct application of a procedure, such as starting a generator, assembling equipment, adjusting or operating equipment, and so forth. Such performance can be tested through (1) a paper-and-pencil test of information about performance, or (2) a hands-on-test of performance.

1.   About paper-and-pencil tests. Paper-and-pencil knowledge tests are more efficient than hands-on tests, relatively inexpensive to construct and administer, and can pinpoint particular items of information without requiring the trainee to act out a long string of steps. Tests of knowledge can test the maximum amount of crucial information.

Knowledge tests have disadvantages, too. They may include reading demands that are not present in the job or test irrelevant information. You must be careful not to include theoretical, terminological, and general information the job itself does not require.

Also, paper-and-pencil tests often fail to call for information about cues and responses that are found in job performance. Sometimes it is not even possible or practical to represent all the important cues with a paper-and-pencil test. For example, how would we ask whether paint is thick enough to apply? This is hard to describe in a written test. Changes in response requirements are even more likely. Paper-and-pencil tests almost always ask the student to select the correct response, but the task on the job is often to produce the correct response.

Paper-and-pencil tests (unlike hands-on tests) cannot represent all the information involved in performing a task. (Example: Open hatch by grasping handle, turning handle clockwise, and pulling outward.) Constructing a paper-and-pencil test always means deciding what to represent and what to leave out. Often you have to add special cues not available on the job to tell the students what information you want. In a multiple-choice test, for example, if you ask when to do something, you may give away information about other aspects of the task as well.

Finally, there is the problem that the behavior required by paper-and-pencil tests may not be the same behavior ordinarily required on the job. For instance, it has been demonstrated that mechanics perform a greater number of equipment checks in paper-and-pencil simulations of troubleshooting than they do on the job. Presumably they make more checks on the paper-and-pencil simulation because they do not really have to set up and calibrate test equipment in the simulation.

2.   About hands-on tests. The major advantage of using hands-on tests is that they tend to include all of the information and acts required in actual performance. This happens without your having to identify each element of performance and putting it in the test. On the other hand, hands-on tests have drawbacks. They are costly and time-consuming to construct and administer. Because you usually have to give them one-on-one, the number of tasks you can evaluate in any particular situation is limited. Someone has to observe and score the person being tested or the product of the test. This makes scoring less reliable, because different scorers tend to score differently, unless they are well trained. Well constructed checklists reduce, but do not eliminate, this problem.

7.4.3   Application of Rules and Principles

Testing the application of rules and principles differs in at least one big way from testing the direct application of a procedure: As rules can be applied in many situations and principles explain a variety of events, their applicability to a situation must first be recognized. (Procedures are aimed at particular situations, and their applicability does not need to be recognized.)

Suppose someone has to put out a fire. He or she needs to know that the correct procedure depends on the type of fire as well as how to put it out. This is a case of having to apply a rule. The rule might be "On paper and wood fires, use water; on oil fires, use carbon dioxide."

Contrast this with the basic procedure for assembling an M16 rifle, which is a procedure that is done the same way each time. You do not have to learn a lot of rules to apply to different M16s. You follow the same procedure for one M16 as you would for another M16.

So the use of rules and principles generally requires (1) recognition that a rule is applicable in a particular situation and (2) knowledge of the rule. But the use of a procedure is generally suggested by the situation and only requires knowledge of the procedures.

This difference is important and affects the way you test tasks involving rules and principles. When the ability to apply a rule is to be tested, the test has to give the trainee a chance to reveal awareness of the relevance of the rule to the task. Then, the trainee can be tested for knowledge of the rule itself.

While knowledge of a rule can usually be tested with a paper-and-pencil test, testing for recognition of the applicability of a rule is more difficult. In conventional multiple-choice knowledge tests, just asking about a rule is enough to "cue" it as a possibility. Only if the knowledge test (such as an essay test) did not introduce information that would not be available on the job, could awareness of the relevance of rules and principles be tested. When this is not possible, the best way to ensure valid testing is to use a hands-on test of performance.

7.4.4   Problem-solving, Troubleshooting, or Decision-making Tasks

Tasks that are often labeled as problem-solving, troubleshooting, or decision-making present special problems in testing. In these tasks, the facts and options to be taken into account are not obvious. They must be thought of and selected by the performer. For example, the person attempting to solve a problem has to think of different ways that might lead to a solution and the troubleshooter (unless he or she has a troubleshooting job aid) must think of checks that will eliminate whole areas ("split-half" technique) or use some other strategy, such as checking items with high probability of failure. Then he or she has to decide which components, symptoms, and test readings to examine to carry out the strategy. The decision maker may have to think up likely possibilities as well as determine a basis for picking one of them.

The freedom of performance in these tasks means that you face two problems in testing. First, a variety of possible features of the test can easily influence how well the student performs. Therefore, when you are testing problem solving and decision-making tasks, you have to avoid any differences between job and test behavior that might be caused by the form of the test itself.

Second, the test of problem-solving and decision-making tasks must not restrict or define performance more than the actual job situation. This is because an important part of performance in these tasks is being able to pick out important cues that are not obvious. The best approach is probably to try to reproduce as many of the characteristics of the work situation as possible by using a hands-on performance test. It is probably best to test problem-solving, troubleshooting, and decision-making performance with a hands-on test, even though such tests may also include elements of performance that are not really necessary for your purpose.

7.5   Summary

To plan your test, you have to make three decisions: (1) what to cover, (2) how to sample it, and (3) what form(s) of test to use. The decision of what to cover, which is called defining the performance or content domain, is the most important step in planning your test. If you cannot decide what you want to test, you cannot test it very well.

Since you cannot cover the whole performance domain in a single test, you have to sample the domain. There are a variety of strategies you can use for sampling. If you consider several strategies, you can be more deliberate in what you put on the test. If you do not pick a sampling strategy, you may end up with a "hit-or-miss" test.

To decide what form of test to use, you need to think about the performance domain. Does it contain motor/perceptual skill, application of procedures, rules, or principles, or problem solving? The answers to these questions will help you decide whether to use a paper-and-pencil knowledge test or a hands-on performance test.

Remember that planning your test is the most important part of test development. This is where you make the connection between the test and the performance you want to measure. If that connection is loose, it does not matter how well you construct the test. In other words, it does not help to measure something well, if you are measuring the wrong thing. Be ready to spend a lot of time on test planning.

8.0   CONSTRUCTING A TEST

When you have planned what kind of test you need, you can start to build it. This chapter covers two kinds of tests: paper-and-pencil knowledge tests and hands-on performance tests. You should know that there is not really a complete distinction between knowledge and performance tests. All tests measure "knowledge," even hands-on tests. Paper-and-pencil tests often measure so-called "performance."

Example: In some jobs (e.g., instructor, finance officer, computer programmer, clerk, or intelligence officer), people work mostly with words and symbols. For jobs like these (in fact, for most jobs), paper-and-pencil tests can represent many job tasks. If the task involves paper-and-pencil tasks on the job, then a paper-and-pencil test is really a performance test.

Also, no "performance" test is really a test of performance. The person taking the test knows it is a test, not a work situation. There is always that difference between a performance test and real performance. Also, most performance tests omit much that would be included in performance on the job. That does not mean the test is bad, but that paper-and-pencil and hands-on tests are both representations of performance, not performance itself.

Paper-and-pencil tests and hands-on test call for different development procedures. In this chapter, we will describe paper-and-pencil test construction first.

8.1   Constructing Paper-and-pencil Tests

You begin the construction of a paper-and-pencil test by writing a "pool" of items. The item pool gives you alternate items to diagnose student deficiencies, a basis for making alternate forms of a test, and, most importantly, extra material for a tryout. Then, when you try out your test, you can throw away weak or defective items.

It is hard to tell if a test item is bad just by looking at it. It takes a lot of skill to see what meanings students will "read into" an item. Therefore, the best way to identify bad items is to make up a trial test and give it to persons with the same characteristics as the ones who will take the real test later. This way, poorly written items show up fast.

In your pool of test items, you can include more than one type of item. The pros and cons of four different types of items are discussed below. These are not the only types, though. For more information, review your IMS lesson on developing objective-referenced tests and the Handbook for Testing in Navy Schools (Ellis & Wulfeck, 1982).

8.1.1   Free Response Items

Free response items, which are usually called "fill-in-the blank," contain blank space for the answer. The answer could be either words or phrases. This is the only type of objective test item in which the student must produce the correct response instead of merely recognizing it on a list. That is its biggest advantage.

The trouble is, free response items are hard to construct and score. You have to ask the question just right so that the student knows exactly what answer to give. This is hard to do without giving away the answer. Even when you ask your question just right, two different students might word their answers differently, which causes scoring problems. When different words are used by different students, the instructor has to judge the answers and objectivity suffers.

Follow these two rules when you write free response items:

1.   Do not take statements directly from a text and use them as free response items. Statements removed from their original text are often confusing.

2.   Use free response items only for questions that can be answered briefly in a few words or a few sentences.

8.1.2   True-false Items

Although true-false items are very easy to write, you should generally avoid them in tests. (It is better to use true-false items only for study questions where your goal is to make students think.) They are not very reliable for the following reasons. If true-false items are just "lifted" from a manual, the sentence is usually either printed word-for-word ("true") or a few words are changed to make it "false." This only tests rote memory.

If you use true-false items to test knowledge broader than facts, you run into another problem. Very few statements are all true or all false. Test constructors often

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"cover" themselves by putting in qualifying words like sometimes and never. Well, the student can often spot these "qualifiers" a mile away. Good true-false items that do not give away the answers are very difficult to write. Follow these three rules when you write true-false items:

1. Use true-false items only to test statements that are always true or false.

2. Do not use true-false items to test statements that must be long and complicated to be universally true or false.

3. Do not take statements directly from textual material. They often cease to be universally true or false when removed from context.

8.1.3 Matching Test Items

In matching test items, the student is presented with two lists. The student picks the items in one list that match the items in the other. Like true-false items, matching items are good for testing recall of names, terms, statements, functions, or other facts.

Watch out for two pitfalls when you construct matching items. First, all things on your list should be of the same type--all people, or all weapons, or all terrain features. Otherwise, it is too easy for the student to figure out the answers. Second, be sure any "wrong" elements are reasonable and believable. If you include more elements in one list than you do in the other (a good idea), be sure the extra elements fit in with the real ones.

Follow these two rules when you write matching items:

1. Be sure that the basis for matching is clear.

2. Use a short list of responses to match to the list of cues. Long lists always have unimportant elements in them. The purpose of the item is to test knowledge, not the ability to keep a long list in mind while making a choice.

8.1.4 Multiple-choice Items

Multiple-choice items have a question (or "stem") and several responses. You can ask the student to indicate the correct response, incorrect response, or best response. Multiple-choice items avoid some of the problems of other types of objective items. They avoid the subjectivity of the free-response item, the absolute truth needed by the true-false item, and the same-type responses needed by the matching item.

Follow these five rules when you write multiple-choice items:

1. Experts should agree on the correct response. Use several knowledgeable persons to review the item.

2. Avoid negatively stated items. They often confuse the student.

3. Be sure your incorrect responses (distractors) are believable. Do not use distractors that are obviously wrong even to someone who does not know the information being tested.

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4.   Do not use responses that overlap such as: "The gas tank of a 1/4 ton truck holds (a) less than 25 gallons or (b) less than 20 gallons."

5.   Locate the correct answer randomly among the response positions.

8.1.5   Test Item Review

Have every item you write reviewed by another subject matter expert. There are several reasons for this practice. First, a person who writes a test item cannot judge how clear it will be to others. (It always seems clear to the item writer!) The best way to see if the item is clear to someone else is to give it to another person for review.

Second, you need someone else to tell you if the item is really pertinent to the job. It is well known that many paper-and-pencil test items are not relevant, but they get into tests because they were easy to write. The more experts who look at your test items, the better the chance to "weed out" items that are not relevant.

Third, you need a "second opinion" about this question: Is the paper-and-pencil format really adequate for this task? Earlier, you decided that the paper-and-pencil format was appropriate. Now that you have written some items, double check your decision. Is the item, as written, a good indicator of whether the trainee can perform? If you think so, find out if other subject matter experts agree.

8.2   Constructing Performance Tests

A performance test is sometimes called a work-sample test, because it requires the trainee to perform a sample of the activity from the work situation. Of course, a work sample rarely consists of work exactly as performed in a job. The work sample is going to be scored and the trainee knows it. The conditions and responses of the work situation have been changed, too. But the sample of work should represent important features of the job. In addition, a performance test must be administered in a standardized way.

To construct a performance test, you need to answer five questions:

1.   What will be scored?
2.   How will performance be scored?
3.   How will the test be set up?
4.   How will the student know what to do?
5.   How will the scorer know what to do?

We will address these questions one at a time.

8.2.1   What to Score

The two basic types of performance tests are (1) process-scored and (2) product-scored. First, you need to figure out is which kind of task you have.

"Perform an about-face" is an example of a process-scored task. It should be process-scored because the scorer must watch the whole movement while it is being done. There is no other way to find out if it was done right. Some other examples of actions that should be process-scored include performing the manual of arms and playing "Taps."

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"Tie a square knot" can be product scored because the scorer does not have to see the knot being tied. If there's a square knot in the rope at the end of the test, then the student has tied a square knot. That is all there is to it.

Lots of actions can be scored either way; for example, change a tire, assemble a rifle, set up a Claymore mine, etc. That is, if you perform all the steps correctly, then you always end up with the correct product.

Use product-scoring, if you can, as it is easier to administer and standardize. Sometimes the scorer can test more than one person at a time. Look hard at the task or skill you want to test to see if it can be product-scored. (Many tasks that can really be product-scored look as though they have to be process-scored, because they have usually been described as a process, a series of steps.) Often, for example, you can test with a function check (product-scoring). You do not have to see the weapon being assembled (except sometimes to check for safety rules). Another example is that you could perform a function check to see if a radio was set up correctly. These obvious examples illustrate how you should look at your tasks to see if you can use product-scoring.

8.2.2   How to Score Performance

Performance will be scored by the actual performance measures that make up the body of your performance test. Whether these will be process-scored or product-scored measures will depend on the task or skill you are testing. Either way, you need to tell the scorer what to look for and the standards of acceptable performance. Figure 8-1 is an example of process-scored performance measures for folding the U.S. flag. (Folding the flag could also be product-scored.) Figure 8-2 is a set of product-scored measures for baking a jelly roll.

FOLDING THE UNITED STATES FLAG

		GO	NO GO
A.	Folded lower striped section over blue field (1st lengthwise fold).	__	___
B.	Folded the folded edge over to meet the open edge (2nd lengthwise fold).	__	___
C.	Started triangular fold by bringing striped corner of the folded edge to the open edge.	__	___
D.	Repeated folds until entire length of flag was folded into a triangle with only the blue field and margin showing.	__	___
E.	Tucked margin into the pocket formed by folds at blue field edge of flag.	__	___

Figure 8-1. Example of a process-scored performance measure.

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┌─────────────────────────────────────────────────┐
│ BAKED JELLY ROLL                                 │
│                                      GO  NO GO   │
│                                                  │
│ A.  Role is cut in 20 slices.          _  ____   │
│ B.  Powdered sugar is evenly spread.   _  ____   │
│ C.  Jelly is evenly spread.            _  ____   │
│ D.  Roll is tightly rolled.            _  ____   │
│ E.  Roll is baked all the way through. _  ____   │
└─────────────────────────────────────────────────┘
```

Figure 8-2. Example of a product-scored performance measure.

Performance measures come from well stated objectives rigorously derived from task analysis. The importance of good task analysis and clear, complete objectives really shows up when you start to develop tests. The elements of task performance must be clearly spelled out so you can tell whether the student has performed correctly.

As the rules for constructing process-scored measures differ a little from those for constructing product-scored measures, two sets of rules are presented in the following pages. In both types of measures, you tell the scorer what to look at and how to judge what he or she sees. To do this, you sometimes have to refine the statements from job or task analysis.

8.2.2.1 Rules for Process-scored Measures

1. Be sure the standard is clear. Before you use the action "as is" from the task analysis, double check to be sure that it includes the standard. Standards answer questions like "how much" or "how well." Be suspicious of words such as turn, adjust, tighten, and others that call for judgment and words ending in "ly" such as properly, rapidly, and firmly. They might be scored differently by different scorers.

2. Put only one action in each scorable measure. Do not confuse the scorer; for example, "Removes clip and pulls slide to the rear" may be confusing. What about the soldier who removes the clip, but does not pull the slide to the rear? You are asking the scorer to judge which is more important. Separate any combined performance measures you find.

Note. Simultaneous actions are OK. "Depresses accelerator while engaging starter" is acceptable because it can be scored as right or wrong. Stating how a step is performed, such as "Aligns sight by traversing, elevating, or depressing gun tube," is also acceptable.

3. List only necessary actions. Do not state an action if it depends on other actions; for example, "Releases safety cover; activates firing switch." If the firing switch cannot be activated without releasing the cover, you can omit the first element. Be careful not to overwhelm the scorer with performance measures. The scorer cannot observe the student while marking the score sheet.

4. **Be sure the action is observable.** An eye or head movement might not be observable as a physical act. For example, "Throttle is in idle position" can be evaluated only if the throttle is placed in an incorrect position and the student has to move it. Similarly, "Checks radar scope" may actually mean the student has to turn and look at the scope. In a case like this, you should cue the scorer to the performance by stating, "Turns and looks at scope #1 before activating scanner."

5. **State error limits.** Many standards, especially with measurements, allow a range of accuracy; for example, "700-800 rpm" or "within 50 meters" tell the scorer the range allowed.

6. **State safety measures.** If safety is a factor, write a safety performance measure stating what actions must or must not be done. The scorer should intervene to prevent the violation if possible. Be specific. Statements like "Commits no safety violations" are not acceptable.

Example of acceptable safety measure:

		NO
	GO	GO
a. Examinee removes watch and rings, if any, before working on radar chassis.		

7. **State the time limit.** If the task has a time limit (e.g., "Mask in 9 seconds"), it is a separate performance measure. Make sure both the scorer and the student know when to start and stop. If the task has no time limit, you have to state one for efficient test administration. In this case, the time limit is not meant to be the deciding factor in whether a student is "GO" or "NO GO." Talk to job experts and conduct field tryouts to arrive at a reasonable time limit.

8. **State the sequence.** Look at the sequence of the task elements carefully. Some tasks require all steps to be in order; and others, only some steps. If a particular order is required, state it as a separate performance measure. Tell the scorer on the score sheet if order is not important.

8.2.2.2 Rules for Product-scored Measures

1. **Define an acceptable product.** This is like the standard of performance. The standard in typing correspondence may be that a letter is in the right format and contains no strikeovers or misspelled words. An acceptable product may be a condition such as an engine that runs or a telephone that rings. It may be an action such as a weapon function check or it may be something produced such as a completed form or a computer program. When you are developing the test, carefully examine products for all dimensions and define all standards required for scoring. Examples of various dimensions include format, tightness, tolerance, shape, location, position, time, size, and adjustment limits.

2. **State error limits.** See process-scored measures, rule 5.

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3. State the time limit. See process-scored measures, rule 7.

4. State whether scoring aids can be used. Scoring aids are used to help standardize what is being scored such as overlays, templates, diagrams, photographs of correct product, and photographs showing unacceptable characteristics. Scoring aids do take time to prepare, but consider using them when words alone do not convey an accurate understanding of the standard. Example: The task "Prepare route overlay" leads to a product that is difficult to describe in words, but can be clearly shown by example. (You may also find scoring aids useful in scoring process-scored measures.)

8.2.3 Test Setup

The test setup is stated by the test conditions, which include environmental, equipment, and test station conditions. First, determine what the conditions should be and then translate them into instructions to the scorers. Your goal is to give the test exactly the same way to every student every time.

1. Environmental conditions. Environmental conditions apply mostly to tasks performed outdoors. You will mostly be concerned about adverse conditions. If one student is tested in the rain and another is tested in the sunshine, will the test be fair? If it is not, specify acceptable conditions of visibility, temperature, precipitation, light level, etc.

2. Equipment conditions. Equipment conditions are among the most important aspects of hands-on testing. Again, your concern is to standardize the test conditions for all students. List all items of equipment needed for the test, including publications. Then, consider all aspects of the equipment itself such as positions of switches, dials, controls, and valves. What faults should be built in? How should the equipment be set up for each student?

3. Test station conditions. Test station conditions depend on the task. Some can be performed anywhere, while others cannot. Boresighting a large-caliber gun may require a line-of-sight of over 1000 meters. At a minimum, consider these factors: indoor/outdoor, shop/workbench/field range, distance, and terrain and vegetation.

8.2.4 How the Students Know What to do

You will write a set of examinee instructions to tell the students what they are to do. In hands-on testing, the scorer usually reads the instructions to the students; therefore, you will be writing a "script" for the scorer to follow word-for-word.

Be concise and direct when you write the instructions. Your instructions must be easily understood and complete so that the scorer will not have to explain or answer questions before the test. Students hearing them should get the picture right away to prepare mentally for the task. Cover the following areas in your instructions:

1. State the job situation. Examples: "You are conducting a weapons inspection." "You are the S-3 of a tank battalion." "This Marine has a broken arm." Do not, however, tell the students what they are supposed to figure out by themselves. To say, "You're setting up a Claymore mine and you haven't made the circuit check yet" would give away the fact that a circuit check should be performed.

2. State what the students are to do. You may have to include a statement about how far the student should go. (Example: "Do not enter the control number in the log.") Be careful not to tell the student how to do the task. Do not say, "Put on your protective mask and clear it." The student should remember to clear it himself.

3. State the time and accuracy limits. Example: "You must complete the task within 20 minutes." "Your final charge must be plus or minus 1/8 pound." Be careful not to "cue" the student as to what to do.

4. State what assistance will be provided. Tell the student if assistance will not be provided. If there will be help, say what kind. Examples: "I will issue the fire command to you." "I will position the aiming stakes as you direct me."

8.2.5   How the Scorer Knows What to do

To give each student a fair, standardized test, you need to write clear instructions to the scorer. Be precise and do not leave things up to the scorer's "best judgment." Tell the scorer exactly what to do. At a minimum, include the following directions:

1. State the requirements for setting up the test station. If flammable materials have to be removed, say so. If the area has to be free of visual distractions that normally are there, say so. Tell how to set equipment faults, switches, etc. Tell the scorer just how to set up the test station using a diagram if needed.

2. State how many students can be tested at once. Examine the task to determine how many students should be tested together. Usually the maximum is four, but for a process-scored test you can generally test only one at a time.

3. State what kind of help the scorer can give, if any. If the scorer is to act as a team member, tell how. If the scorer is to intervene on safety violations, tell when and how.

4. State time limits. Tell the scorer the time limits, including how to time the test, what to do when the student goes over the time limit, and perhaps a reminder that time limit means limit.

8.3   Summary

Paper-and-pencil tests and performance tests call for different methods of construction. You start developing a paper-and-pencil test by writing a pool of items, because you will discard many items when you try them all out. Developing a performance test starts with writing performance measures based on objectives derived from task analysis.

This chapter presented the rules for constructing both kinds of tests, including rules for different types of test Items and for process-scored and product-scored performance tests. Use multiple-choice items in paper-and-pencil tests when you can. In hands-on tests, use product-scoring if possible. These are general rules. In some cases, you will need to use the other kinds of test items and measures discussed here.

Developing good tests can be a long, hard process. The rules in this chapter are adequate enough to guide you, but there is no substitute for lots of practice. You should

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study test construction because individualization calls for more testing than does lockstep instruction. Be prepared to develop a lot of tests if you are going to individualize.

9.0 TEST TRYOUT AND IMPLEMENTATION

After planning and constructing your tests, you need to try them out. After tryout and revision, you can implement them in your course. In this chapter, you will learn how to try out paper-and-pencil test items and hands-on performance measures. Finally, you will learn about implementing your tests in an individualized instruction system.

9.1 Tryout of Paper-and-pencil Tests

The goal of your tryout is to discover poor items and instructions. Then, you can discard or revise the poor items, revise the instructions, and end up with a better test. A poor test item (1) has no correct answer, (2) has more than one correct answer, (3) is confusing (ambiguous), (4) is irrelevant, (5) does not agree with doctrine, or (6) does not separate masters from nonmasters.

Before you begin any tryout, show your test items to instructors, test developers, or other subject matter experts. Ask them to criticize the items and locate factual errors. Let them answer the items to see if your directions are clear. This "pre-tryout" can eliminate most of the obvious errors in the items.

After you have corrected the errors your "critics" found, you are ready to conduct the formal tryouts, which will be done in two phases: (1) expert tryout and (2) validation.

9.1.1 Phase 1. Expert Tryout of Paper-and-pencil Tests

For this phase, you will need at least three experts in the area you are testing. If you only use two and they disagree, you would not know who is right. Using three experts does not indicate whom to rely on, but it does provide a way to settle disagreements by majority opinion. Do whatever you can to get high-level performers for the expert tryout. You do not want recent graduates, no matter how well they did in school. You want experienced job performers, perhaps senior NCOs or officers. Consider asking some experts with whom you usually do not work, as they may be more critical.

The purpose of your expert tryout is to find all test items that are poorly constructed and do not agree with doctrine. (You will see if the items separate masters from nonmasters in Phase 2.) First, give the test to the experts. Then, have them fill out a questionnaire to help you decide what to do about each item. If an expert fails an item, you will find out why. Follow these steps.

1. Administer your test to the experts. (Do not tell them the answers until after step 2.) You can give them the test all at the same time or separately.

2. Give the experts the expert tryout questionnaire shown in Figure 9-1. (It is also provided on p. C-3 for you to reproduce as needed for your course.)

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1. Do you think you answered each item correctly?

   A. Yes.   B. No.   C. Not Sure.
   (Go to 4.)   (Go to 2.)   (Go to 3.)

2. Which items do you think you did not answer correctly?

3. Which items are you unsure about?

4. Is this test realistic? (Does it reflect how the job is done?)

   A. Yes.   B. No.   C. Not sure.

5. Were the words or phrases in the test easy to understand? (If "No," indicate in the space below the words or phrases that gave you trouble.)

   A. Yes.   B. No.   C. Not sure.

6. Are all of the alternatives to each item believable? (If "No," indicate the alternatives that are not believable.)

   A. Yes.   B. No.   C. Not sure.

7. Are all the items relevant to the job? (If "No" or "Not sure," indicate the items that should be deleted.)

   A. Yes.   B. No.   C. Not sure.

8. As the test is now written, do you think it is a fair measure of a student's ability to perform on the job?

   A. Yes.   B. No.   C. Not sure.

Figure 9-1. Expert tryout questionnaire.

3.   Go over the test items, one at a time. The first sign that an item is well constructed and agrees with doctrine is that all experts get it right. If any expert fails an item, find out why. Maybe the expert was not as expert as you thought. More likely, your test item is at fault. It might be misleading.

Use question #1 on the expert tryout questionnaire (Figure 9-1) as your main guide. If an expert thinks he failed an item and did fail it, he has probably forgotten the procedure. The item may be OK. If he is not sure of his performance (answer C) and then he passed, the item's wording may have a defect, or one "incorrect" response may be as correct as the correct alternative. When an expert thinks he passed an item that he failed, the item may go against doctrine or the "correct" response may be wrong (or at least no more right than one of the other responses).

The second sign that items agree with doctrine is that experts think the test is a fair measure of a student's ability to perform on the job (question #8, answer A). Any

other response to that question indicates that the test is not yet acceptable. Interview each expert who responds to question #8 with answers B or C. After the expert tryout, revise all the items that had deficiencies. If a lot of changes were required, you should think about going through the expert tryout again with three new experts.

Suggested actions, which are keyed to the questions and answers on the expert tryout questionnaire, are listed on p. C-4.

9.1.2   Phase 2. Validation of Paper-and-pencil Tests

You will find out if your test separates masters from nonmasters during validation. "Validation" in the world of testing means seeing if performance on the test is a good indicator of anything else. Why is validation important? After all, we just revised the test after three experts took it. What more is necessary?

Well, so far, only experts have been tested; but your test is not going to be given to experts. It will be given to students. Validation will tell you if it will work for students. If your test is really a test, then masters of the subject should score higher than nonmasters. If there is no difference, the test is really telling you nothing.

What then is a master of the subject? What is a nonmaster? Should senior NCOs score higher on your test than junior NCOs? If so, you have a master/nonmaster distinction right there. Should graduates of your course generally score higher than nongraduates? Experienced performers, higher than recruits? Field grade officers, higher than second lieutenants? Any two groups like these can be termed master and nonmaster. To validate your test, think of two groups--one group that you expect to score high and one that you expect to score lower. Of course, you will need to use your best judgment in selecting the groups.

One of the validation steps described below is computing an "agreement" index. The agreement index refers to agreement between performance on the test (right or wrong) and whether the individual is in the master or nonmaster group. For each item, the agreement index must be greater than zero. There are many other ways to validate tests, but the agreement index is one of the simplest and easiest to use. Follow these steps to validate your paper-and-pencil tests:

1.   Determine two groups: One group including those that you consider to be masters of the subject; and the other, that you consider to be nonmasters. Get other subject matter experts to help you make this decision. Your choice of group members should be one that other experts agree is realistic.

2.   Identify 10 to 20 individuals from each group to take your test. You should have a minimum of 10 in each group and a minimum of 30 all together. (You do not have to have the same number of masters and nonmasters.)

3.   Administer the test to 30 or more persons under the same conditions as in actual use.

4.   Score all the tests.

5.   Looking at the score sheets, make up a big table like the one in Figure 9-2. Enter M for masters and N for nonmasters. Use P for passing the item and F for failing the item. (A blank copy of the table is provided for your use on p. C-5.)

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NAME	M/N	1	2	3	4	5	6	7	8	9	10
1. Verduin	M	P									
2. Berge	M	F									
3. Brooks	M	P									
4. Green	M	F									
5. Bromberg	M	P									
6. Ljungren	M	P									
7. Arlee	M	P									
8. Peterson	M	F									
9. Andrews	M	P									
10. Staelin	M	P									
11. Jackson	M	F									
12. Canter	N	P									
13. Malone	N	F									
14. Lawler	N	P									
15. Jensen	N	P									
16. Tiernan	N	F									
17. Stanley	N	P									
18. Keillor	N	F									
19. Hinshaw	N	F									
20. Staples	N	P									
21. McKinnon	N	F									
22. Zeitler	N	P									
23. Clark	N	F									
24. Manson	N	P									
25. Dailey	N	F									
26. Jorgenson	N	P									
27. Fromm	N	P									
28. Pfeiffer	N	F									
29. Chang	N	P									
30. Guerra	N	P									

Figure 9-2. Table for recording performance of masters and non-masters in validating paper-and-pencil test items.

6. Compute the agreement index. For each item, draw a four-way table (Figure 9-3) or reproduce and use the form on p. C-6. Enter the number of masters and nonmasters who passed and failed as shown in Figure 9-3. Then,

Agreement index   = (A x D) - (B x C).

The agreement index for item 1 in Figure 9-2 would be computed like this:

Agreement index   = (7 x 8) - (11 x 4)
12   =   56   -   44.

The agreement index is 12. Any level greater than zero is acceptable. In other words, A x D must be greater than B x C. (The bigger the agreement index, the better. An agreement index of 12 is nothing to shout about.)

> Note. When you are computing an agreement index, you are comparing the proportion of masters who passed the item to the proportion of nonmasters who passed the item. You could use percentages instead if you prefer, but the agreement index makes it even simpler.

	MASTERS	NONMASTERS
PASS	A 7	B 11
FAIL	C 4	D 8

Figure 9-3.   Table for computing the agreement index in validating paper-and-pencil test items.

If the agreement index is zero or negative (that is, if A x D is not greater than B x C), you should revise the item. You can interview the persons who took the test to see what is wrong or you could administer the expert tryout questionnaire as before. If a lot of your items need revision (more than one-third), validate the test again after you have revised it. Use a different group of individuals than the last time. Do not include anyone who has taken the test before. The second time around, you should have at least 7 masters and 7 nonmasters and a total of at least 20. (If possible, get at least 10 of each.) Perform the second validation the same way you did the first one.

9.2   Tryout of Hands-on Tests

The goal for trying out hands-on tests is to discover faulty performance measures and instructions so that you can revise your test as needed. A faulty performance measure (1) is not observable, (2) is not scored consistently, or (3) does not relate to the job.

Before you begin the tryout, show your performance measures to other subject matter experts, just as you would paper-and-pencil tests. Ask them to critique the measures for clarity, accuracy, and relevance. When you have changed the test according to these critiques, try out and validate your hands-on tests. The phases are the same as for paper-and-pencil tests, but the steps in each phase are very different.

9.2.1   Phase 1. Expert Tryout of Hands-on Tests

For the expert tryout of a hands-on test, you will need five experts (instead of only three). Two of the experts will act as scorers. The other three will be tested. Get

the best experts you can--not recent graduates, but experienced performers. Again, consider locating some experts with whom you ordinarily do not work, because they may be more critical. Then follow these steps:

1. Pick two of the experts to be scorers. You must have two scorers, not just one.

2. Go over the score sheet ahead of time with the scorers to make sure they understand what they are supposed to do.

3. Have the two scorers together test each of the other three experts (three tests in all). Lay out the equipment and set up the test station the way it will be when you test for record. Have just one scorer read the directions to the person being tested, but have both scorers fill out score sheets separately. Have them test only one person at a time.

4. Check for agreement between scorers. If the two scorers scored any performance measure differently, find out why. Talk over the disagreement with both scorers and with the person who was tested. Was one scorer out of position so he or she could not see the performance? Or was there a disagreement about what the performance measure meant? Find out why the scorers disagreed, then change the instructions or the score sheet to fix the problem.

5. Administer the hands-on test questionnaire shown in Figure 9-4. (It is also provided on p. C-7 for you to reproduce as needed.)

6. Revise your test. If more than one of your five experts think that the task you are testing is not a job requirement or that the test is not fair or complete, revise the test.

Pay special attention to any performance measures that experts fail. Find out if experts agree that their own performance was wrong. If they do not agree that they were wrong, double check the performance measures and the task analysis.

9.2.2   Phase 2. Validation of Hands-on Tests

The purpose for validating hands-on tests is to see if scorers agree when they give the test to students. Up to now, only experts have been tested. Although experts do not make a lot of mistakes, students will score all the way from low to high. Giving the test to representative students is a more realistic way to see if scorers will really agree.

For validation, you will need five students who are familiar with the task you are testing. Therefore, pick about ten and show them a description of the task. (You can use the task analysis as a description.) Then, give them all this little quiz:

How well can you do this task?

0. Not familiar with task at all.
1. Not very well.
2. Fairly well.
3. Very well.

Try to pick five examinees who marked #2 or #3. Do not include anyone who selected #0.

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	Yes	No
1. Is the task covered by the test a job requirement?	—	—
If not, why not?		
2. Does the test provide a fair measure of job requirements?	—	—
If not, what changes are required?		
a. Add performance measures?	—	—
Which ones?		
b. Delete performance measures?	—	—
Which ones?		
c. Modify performance measures?	—	—
How?		
d. Alter standards?	—	—
How?		
e. Clarify instructions?	—	—
How?		
f. Change test site or equipment requirements?	—	—
How?		

Figure 9-4. Hands-on test questionnaire.

When you have five students to test, you will need to select four (that's right, four) scorers. Each scorer should have the same MOS as the students and be of equal or higher rank. Give your potential scorers the same little quiz you gave to the students. Select four scorers who picked answer #3 (very well). Then, follow these steps to validate your hands-on test:

1. Hold a rehearsal for the scorers. Have them give each other the hands-on test. You should watch each scorer give the test at least once.

2. Have all the scorers give the test to one student at a time. All four scorers will score each student. The point of validation is to see if the scorers agree. That is why you have so many scorers.

3. Record scores. Collect the score sheets and build a small table showing how each scorer scored each student on the whole test, as shown below.

	Scorer				
	1	2	3	4	P = Pass
1	P	P	P	P	F = Fail
2	P	P	P	P	
Student 3	P	F	P	P	
4	P	P	P	P	
5	F	F	F	F	

4. Compute "scorer agreement." The minimum acceptable level of scorer agreement is 80 percent. Use the small table to build a bigger table (as shown below) to show agreement and disagreement between pairs of scorers. Since you had four scorers, you have six different scorer pairs: 1 & 2, 1 & 3, 1 & 4, 2 & 3, 2 & 4, and 3 & 4:

Scorer Pair

	1&2	1&3	1&4	2&3	2&4	3&4	Total Agree(A)	Total Disagree(D)
1	A	A	A	A	A	A	6	0
2	A	A	A	A	A	A	6	0
Student 3	D	A	A	D	D	A	3	3
4	A	D	A	D	A	D	3	3
5	A	A	A	A	A	A	6	0
							24	6

To compute scorer agreement, divide the number of agreements by the total number of agreements and disagreements. In this case, the scorer agreement is 80 percent (24 ÷ 30 = .80 or 80%).

5. Revise the test if scorer agreement is below 80 percent. If the scorer agreement was below 80 percent, find out why. If you can fix the problem easily, do it. Maybe one of the four scorers had to stand so far away that he or she could not observe the examinee, or the problem may be bigger than that. You may need to reword some of the performance measures. If you change the performance measures at all, go through the tryout process again to see if your changes helped.

9.3   Evaluation Implementation

In Chapters 2 and 4, you saw how important evaluation is in individualized instruction. Each of the individualized systems you read about used a lot of tests. Testing tells the instructor what the student needs to do next. You should pay extra attention to the way you give tests in your individualized system. This section will discuss (1) giving tests, (2) scoring tests, and (3) using test results.

9.3.1   Giving Tests

In individualized instruction, the student often takes more than one test on the same topic. If you are using paper-and-pencil tests, this means that you probably need

more than one form of each test. (If you're using hands-on tests, one form of each test is enough.) This was one of the reasons given in Chapter 8 for building a pool of items. The item pool gives you enough items to build two, three, or more forms of each test.

Why not give the same test to the same student more than once? The reason, of course, is that, after the student has seen the test questions, he or she can study how to answer them. Giving the same test again would probably not sample the student's knowledge of the whole subject. It would only tell you how well the student knew the exact questions you had put on the test.

1. <u>Rotating forms</u>. Do not use the same test form as the "first" test every time. Rotate the forms of the test so that one student gets form B the first time, another student gets form A, and so on. There are at least two reasons to rotate forms. It makes your testing program more "secure." (Students do not know which form of the test they will get next.) Also, it evens out any small differences in the difficulty of your test forms.

2. <u>Matched forms</u>. Ideally, all of your test forms should be of the same difficulty. Although you may not be able to make them perfectly equal, make them as equal as you can. To do this, keep track of the average score for each form. (This is another reason why you need to "rotate" forms.) After 10 to 20 students have taken each form, compare the average scores. Then "juggle" the items among the forms to even out the difficulty level. Keep doing this as students go through your course. There is no reason why you cannot juggle test items around for several months until your test forms are as perfectly matched as you can make them.

3. <u>Administering forms</u>. Each time you give any form of any test, try to give it the same way. Remember that a test is a test. Being objective and not offering help to a student may be hard sometimes, but it is the best method of training. The best way to make sure the test is given the same way every time is to include clear, simple instructions to the person who will be giving it. Make it clear that the person giving the test must understand the instructions fully, be consistent in presenting them, and not give special help to any student.

9.3.2   Scoring Tests

Consistency and standardization should also be your goals in scoring your tests. Score each test the same way every time. This is easy when the student has scored very high or low. It gets harder to be objective when the student scores near the "borderline." However, if you do not maintain test standards, your students will soon know it. Then, it will be hard to explain why one borderline student passed and another failed. Remember that, for failing a test, a student does not go to Siberia but just "back to the books." So do not be afraid to hold the line.

Your test keys will not be perfect at first. No matter how careful you were to make them correct, students will come up with answers that you had not thought about. As a result, you will have to revise your answer keys.

Follow this rule when you add or change answers In the key: Do not do it alone. At least two Instructors should agree on each addition or change to prevent the "ping pong" effect: Major Jones changes the key, Major Smith changes it back, Major Jones changes the key, etc. You do not need problems like that.

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9.3.3   Using Test Results

Of course, test results direct a student's progress through your course. This is built into the system. But you should do more than that. Test results can point out where a student is having trouble and where your course is having trouble.

Suppose the test shows that a student does not understand a particular part of your instruction. What will you do? Just send him or her back to study more? Of course not. You use the test results. First, tell the student what he or she is doing wrong. Then, devise a short practice assignment or something else to help the student master that particular part of the subject.

Now, what if many students are scoring low on the same part of the test? Again, use your test results and take action. Find out whether the test or the instruction is the problem. (The problem is definitely not with the students, since several had the same problem.) Either part of the test is poorly built or part of the instruction is not clear, not complete, or not correct. Find out why the students are scoring low. Talk to them. Look at the test. Look at the instruction. Use your test results to do something and do not say for week after week that, "They just don't seem to be able to understand."

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APPENDIX A

STUDY GUIDE

    <u>How to use the study guide</u>. Read one chapter of the handbook at a time. During or after reading the chapter, answer the study questions here in the guide. Check your answers and, if any of your answers are wrong, find out why by rereading that section of the chapter.

1.0   INTRODUCTION

Chapter 1 makes three big points:

1.   An individualized system of instruction treats different students in different ways, usually according to how they perform on tests.

2.   In an individualized system, at least one component of instruction usually varies from student to student. Chapter 1 shows you how time and method can vary. Chapter 2 will show you how content and achievement level can vary, too.

3.   Audiovisual media are often used in individualized instruction, but they are not a system. You need more than just media to make an individualized system.

Study Questions (Chapter 1)

1.   True or false? Individualized instruction means that programmed texts are used exclusively.

        a.   True.
        b.   False.

2.   The procedures you follow from the time the student enters instruction until he or she graduates constitute a_____of instruction.

3.   How is the "system B" American history class described in Chapter 1 more individualized than the traditional system?

        a.   It used small-group instruction.
        b.   It was based on objectives.
        c.   Certain students went to extra classes.
        d.   It was graded pass/fail.

4.   Name four ways in which students differ from each other that can affect their performance.

_____

_____

_____

_____

5.   True or false? In an individualized course, a student can take as long as he or she wants to finish.

        a.   True.
        b.   False.

6.   In a class on amphibious doctrine, the instructor divided a 50-minute class between reading a case study and viewing a tape/slide lesson. This is an example of variable_____.

MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS—1963—A

7.   Name at least one limitation or shortcoming of a live presentation (such as a lecture) in presenting instruction:_____.

8.   In a perfect, or ideal, individualized instruction system, which one of the following would be true?

          a.   Faster and slower students would both get the same amount of study time.

          b.   Every student would get a combination of workbook exercises and individual tutorial aid.

          c.   The use of audiovisual media would be maximized.

          d.   Every student would be taught by the method that matches his or her learning style.

Answers (Chapter 1)

1. b. False.

2. System.

3. c. If you picked choice d, remember that individualized instruction is not just the use of any particular method.

4. The text mentioned: previous knowledge, aptitude for learning, motivation, study habits, writing skill, and reading skill. You may have thought of others, too. If you are in doubt, show your answer to an instructor.

5. b. False. You can combine variable time with time limits.

6. Method.

7. The text mentioned two: Live presentations are (a) not easily repeated and (b) not easily referred to. You may have thought of others. If you are in doubt, show your answer to an instructor.

8. d. Unfortunately, the "ideal" system does not exist yet. We do not know enough about the interaction between instructional method and "learning style."

2.0 APPROACHES TO INDIVIDUALIZED INSTRUCTION

The point of Chapter 2 is to make you think about individualized instruction in general terms instead of in terms of only one technique. This is where you should start thinking about your own course in terms of individualization. As you read Chapter 2, think about what you want to vary in your course: content, time, method, achievement level?

Study Questions (Chapter 2)

1. Enter check marks to classify the course you teach now in terms of the four factors below.

Factor	Fixed	Variable
Content	_____	_____
Time	_____	_____
Method	_____	_____
Achievement level	_____	_____

2. Should anything about your course be changed to make it easier to individualize it? How?

_____.

3. An instruction system in which faster students go on to study electives is an example of _____ content.

    a. Fixed.
    b. Variable.

4. A system that uses self-paced programmed texts only is an example of _____ method and _____ time.

    a. Fixed.
    b. Variable.

5. In a self-paced class, suppose that students have several ways to study the same objectives: study guides, texts, and tapes. This class has variable:

    a. Time and content.
    b. Time and methods.
    c. Content and methods.
    d. Time, content, and methods.

6. You are an instructor in a workshop/tutorial system. A student has just failed the first test for a particular lesson. What will you do now?

    a. Assign a retest immediately.
    b. Provide individual tutorial assistance.
    c. Have the student read the workbook over again.
    d. Send the student to the next lesson.

7. In a study guide system, the instructor:

    a. Never works with the student until after the first lesson test.
    b. Lectures once each day.
    c. Is available to explain something that the student does not understand.
    d. Is essential to guide the student through each part of the text.

8. You are an instructor in a fixed-pace individualized system. In your course:

    a. Students in a class will graduate after different lengths of time, probably with different levels of achievement.

    b. Students in a class will all graduate at the same time, probably with different levels of achievement.

    c. Students in a class will all graduate at the same time with the same level of achievement.

    d. None of the above, but students will all spend the same amount of time in independent study.

9. You are an instructor in a course using a programmed text. One of your students has failed the lesson test twice. What should you do?

    a. Have the student read the programmed text a third time.
    b. Pass the student on to the next lesson.
    c. Fail the student for the course.
    d. Switch to a different method of instruction for this lesson.

10. You are an instructor in a worksheet system. One of your students has completed worksheet set #2. What should you do?

    a. Give the lesson test.
    b. Assign worksheet set #3.
    c. Provide tutorial assistance.
    d. Pass the student on to the next lesson.

11. In the peer training system, each student goes on to the next module when he or she has:

    a. Practiced the task with a partner.
    b. Completed videotapes, tape/slides, etc.
    c. Given the lesson test to his/her partner.
    d. Passed the lesson test.

12. An instructor uses an overhead projector to present information from a text. Is this individualized instruction? Why or why not?

_____

_____

<u>Answers (Chapter 2)</u>

      1.   (Discuss the classification of your own course with an instructor.)

      2.   (If you are in doubt about what you could do to make your own course easier to individualize, ask an instructor.)

      3.   b.   Variable content.

      4.   a.   Fixed method.
                b.   Variable time.

      5.   b.

      6.   b.

      7.   c.   If you marked choice d, remember that leading the student through the text is mostly the job of the written study guide.

      8.   b.   If the course is of fixed length, some students will probably reach higher levels of achievement than others in that time.

      9.   d.   If the student is still having difficulty, the programmed text is not likely to be helpful the third time through.

      10.   a.

      11.   d.

      12.   No, not by itself. Using an audiovisual medium like an overhead projector is not individualization. But you can use audiovisual aids within an individualized system.

3.0   THE INSTRUCTOR'S ROLE

Study Questions (Chapter 3)

1.   True or false? The main role of the instructor in individualized instruction is to give tests.

    a.   True.
    b.   False.

2.   One convenient time to provide motivation or encouragement is after correcting a student's work. Name two other convenient times.

    a._____

    b._____

3.   True or false? In an individualized course, the instructor is the primary means of motivation or encouragement.

    a.   True.
    b.   False.

4.   True or false? The most important goal of diagnosis is to tell the student the right answers.

    a.   True.
    b.   False.

5.   What one thing must you do to figure out why a student is having difficulty with an exercise?

    a.   Tell the student how other students have solved it.

    b.   Ask the student to practice more.

    c.   Allow the student to tell you how he or she did the exercise.

    d.   Suggest that the student reread the exercise while checking the procedure in the text or audiovisual presentation.

6.   If a student is doing a series of practical exercises, when is the best time to provide feedback?

    a.   Before practice.
    b.   During practice.
    c.   After practice is over.

7.   True or false? All the feedback a student needs is generally provided by the instruction materials.

    a.   True.
    b.   False.

8.   In what way is counseling easier in an individualized system than in a lock-step system?

_____

_____

9.   Here are four possible problems that a student might have. An instructor must be able to counsel him about which one?

    a.   He cannot understand the instruction.
    b.   His car payments are late.
    c.   He has not been promoted.
    d.   His son is having trouble in school.

10.   Which one of the following is an example of direct instruction?

    a.   An instructor counsels a student about her low grades.
    b.   An instructor administers a hands-on test.
    c.   An instructor demonstrates a new procedure to a student.
    d.   An instructor corrects a student's errors on a test.

11.   One of your students often comes to class late. His progress through the lessons is slow. He has often had to take tests several times to pass. Which functions should you as his instructor perform in this case?

_____

_____

_____

Answers (Chapter 3)

        1.   b.   False. There are many functions more important than that one.

        2.   The text names three others: (a) before a student begins work, (b) when a student asks for an explanation, and (c) at the end of a test or class session. You may have thought of others. If you are in doubt, show your answer to an instructor.

        3.   a.   True. Motivation is one of the things that human beings generally do better than media.

        4.   b.   False.

        5.   c.   None of the other options will tell you what the problem is.

        6.   b.

        7.   b.   False.

        8.   In an individualized system, counseling is more convenient. The instructor can counsel a student without having to interrupt the whole class or wait until after class time.

        9.   a.

       10.   c.

       11.   It looks as though this student problem needs all five: (a) encouragement, (b) problem diagnosis, (c) feedback, (d) counseling, and (e) direct instruction.

4.0   DESIGNING YOUR INDIVIDUALIZED SYSTEM

Chapter 4 reviews the basic parts of any instruction system, individualized or not, because it is so important to include all these parts in an individualized system. By now, you should be making up your mind how your own individualized system will work. Some of the questions below will call on you to say how you plan to build your own course.

Study Questions (Chapter 4)

1. <u>Review Question.</u>   State three factors in addition to time that you could vary in an individualized system:

    a.   Time _____.

    b.   _____.

    c.   _____.

    d.   _____.

2. Match the events in column A with the instruction system components in column B:

A Events	B System Components
a.___ A student asks a question about a statement in a text.	(1) Presentation.
	(2) Student response.
b.___ The instructor tells a student what she got right or wrong on a test.	(3) Feedback.
c.___ A student watches a demonstration on a videotape.	(4) Evaluation.
d.___ The instructor gives a lecture.	
e.___ The instructor administers a performance test.	
f.___ The instructor critiques a student's map overlay.	
g.___ A student develops a scheme of maneuver.	

3. A student asking the instructor questions during a lecture is an example of:

    a.   Presentation.
    b.   Student response.
    c.   Feedback.
    d.   Evaluation.

4. Answering practice exercises is an example of:

    a.   Presentation.
    b.   Student response.
    c.   Feedback.
    d.   Evaluation.

5. Practice exercises themselves are examples of:

    a.   Presentation.
    b.   Student response.
    c.   Feedback.
    d.   Evaluation.

6. Why will you probably need more than one form of your tests in an individualized course?

_____

_____

7. Name one way that feedback is provided in the workbook/tutorial system at the Instructional Management School:

_____

_____

8. What component of instruction directly follows presentation in the basic program of an individualized system?

_____

_____

9. In the basic program of an individualized system, what always follows a student's response?

_____

10. Which two components of individualized instruction are often repeated several times after a presentation?

    a.   Evaluation and student response.
    b.   Feedback and evaluation.
    c.   Feedback and presentation.
    d.   Student response and feedback.

11. Name at least two methods and/or media you could use in your own course to present content:

_____

_____

12. Name at least two methods you could use in your own course to provide for student response after the presentation.

_____

_____

13.	Name at least one method you could use in your own course to provide feedback after student response.

_____

_____

14.	When you are evaluating your students' performance, why do you have to sample?

_____

_____

15.	Name one action you could take in your own course if a student fails one or more lesson evaluations.

_____

_____

16.	How will you individualize your own course? Enter all of your decisions again in the table below.

	Question	Your Decision
a.	How will you present instruction initially?	_____
b.	How will you provide for the student's response?	_____
c.	How will you provide feedback to the student's responses?	_____
d.	How will you evaluate the student?	_____
e.	If the student fails the first evaluation, what will you provide in the way of:	
	(1) Additional presentations?	_____
	(2) Additional student response?	_____
	(3) Additional feedback?	_____
	(4) Additional evaluation?	_____
f.	What will the system do if the student "never" passes the test?	_____

17.	Now, classify the system you have in mind for your own course, according to these four factors:

	Fixed	Variable
a. Content.	___	___
b. Time.	___	___
c. Method.	___	___
d. Achievement level.	___	___

A-12

Answers (Chapter 4)

1. a. Time.
    b. Content.
    c. Method.
    d. Achievement level.

2. a. (2) Student response.
    b. (3) Feedback.
    c. (1) Presentation.
    d. (1) Presentation.
    e. (4) Evaluation.
    f. (3) Feedback.
    g. (2) Student response.

3. b.

4. c.

5. b.

6. Because individualization calls for repeated testing. If a student fails a test one time, you probably will not want to ask the very same questions the second time.

7. Either one of these is correct: (a) answers to practice exercises in workbooks or (b) instructor feedback.

8. Student response.

9. Feedback.

10. d.

11. The text mentions the following ten ways of presenting content: printed text or workbook, videotape, tape/slide, motion picture, closed-circuit television, computer, lecture/demonstration, conference group, teleconference, and programmed text. The methods you picked for your course may be among these or you may have thought of others.

12. The text lists the following ways to provide for student response: study questions, quizzes, problems/case histories, drill-type exercises, and creation of a product. The methods you picked for your course may be among these or you may have thought of others.

13. The text lists the following ways to provide feedback: answer keys, model answers ("school solution"), and instructor critique. The method(s) you picked for your own course may be among these or you may have thought of others.

14. Because you usually cannot put everything on a test. You cannot have the student demonstrate all performance or all knowledge.

15.   The text suggests these actions if a student fails one or more lesson evaluations: Restudy primary presentation, introduce and/or restudy alternate (secondary) presentation method, and receive tutorial aid from instructor or another student. The way(s) you picked for your own course may be among these or you may have thought of others.

16.   (Show your completed table of decisions to an instructor.)

17.   (Show your completed classification scheme to an instructor.)

5.0   QUALITY CONTROL AND MANAGEMENT

Remember that the quality-control methods in Chapter 5 are based on the instructional quality inventory (IQI) (Ellis, Wulfeck, & Fredericks, 1979). There should be copies of the IQI in your IMS classroom. The IQI covers the subject of quality control in detail with examples and lots of practice.

Study Questions (Chapter 5)

1.   The IQI gives you three rules for effectiveness in the presentation of content:

   a.   Separate important points.
   b.   Identify important points.
   c.   Provide help to remember important points.

Which two of these three rules have been followed in the passage below?

   In constructing a Big Cheese sandwich, always place the second
   slice of cheese between the top burger patty and the middle bun.

   Note: Never spread mayonnaise on top of the cheese.

   a.   _____

   b.   _____

2.   Give two examples of labels you can use to identify important points:

   a.   _____

   b.   _____

3.   Make up a "memory trick" (mnemonic) to remember the four types of amphibious operations:

   a.   Assault.
   b.   Withdrawal.
   c.   Demonstration.
   d.   Raid.

   _____

4.   From memory, state one of the rules for adequate examples.

   _____

5.   State one of the rules for adequate practice items.

   _____

A-15

6. Classify the following objective: "List the two branches of an infantry division."

     a. Use principle (aided).
     b. Remember procedure.
     c. Use category (unaided).
     d. Remember fact.

7. Classify the following test item:

     For the 3rd Calendar Inspection begun on an aircraft on a given day, the Job Control Sequence Number would be

         (1) 003
         (2) 030
         (3) B03
         (4) C00

     a. Use procedure (unaided).
     b. Remember procedure.
     c. Use principle (aided).
     d. Remember category.

8. Look at each of the student progress cards (Figure A-1--A-10) on the following pages. For each student, enter the letter (below) representing the action the instructor should take. For this exercise, today's date is Thursday, 19 November and the passing criterion is 90 percent.

_____ (1) Greenberg	a. Administer test form A.
_____ (2) Ralston	b. Administer test form B.
_____ (3) Davidson	c. Administer test form C.
_____ (4) Kahl	d. Assign worksheets Part 1.
_____ (5) Fox	e. Assign worksheets Part 2.
_____ (6) Lathrop	f. Check regularly to see if student can use assistance.
_____ (7) Brzinski	
_____ (8) Johnson	g. Assign student to next lesson.
_____ (9) Green	
_____ (10) Cohn	

9. Next, make up a student progress card for your own course. You will need lots of scratch paper. When you are finished, explain to your instructor how a student would progress through your course. When your instructor is satisfied with your work, have him or her sign off here:

_____

Instructor Sign-off on Student
Progress Card

Figure A-1. Student progress card 1.

A-17

Figure A-2. Student progress card 2.

A-18

Figure A-3. Student progress card 3.

A-19

Figure A-4. Student progress card 4.

Figure A-5. Student progress card 5.

Figure A-6. Student progress card 6.

NAME _BRZINSKI_ (7) MODULE _# 7_

ENTER MODULE

TEST
FORM _C_
SCORE _70_
TIME _____
DATE_NOV 16_

Pass →

ENTER NEXT MODULE

Fail

WORKSHEETS
PART 1
DATE COMPLETED
NOV 17

TEST
FORM _A_
SCORE _80_
TIME _____
DATE_NOV 19_

Pass →

Fail

WORKSHEETS
PART 2
DATE COMPLETED
_____

TEST
FORM _B_
SCORE _____
TIME _____
DATE _____

Pass

Fail

INSTRUCTOR DECISION

Figure A-7. Student progress card 7.

NAME _JOHNSON (8)_   MODULE _#7_

ENTER
MODULE

TEST

FORM _A_

SCORE _60_   Pass

TIME ____

DATE _Nov 17_

Fail

WORKSHEETS

PART 1

DATE COMPLETED

NOV 19

TEST

FORM _B_

SCORE _____   Pass

TIME _____

DATE _____

Fail

WORKSHEETS

PART 2

DATE COMPLETED

_____

ENTER
NEXT
MODULE

Pass

TEST

FORM _C_

SCORE _____   Fail

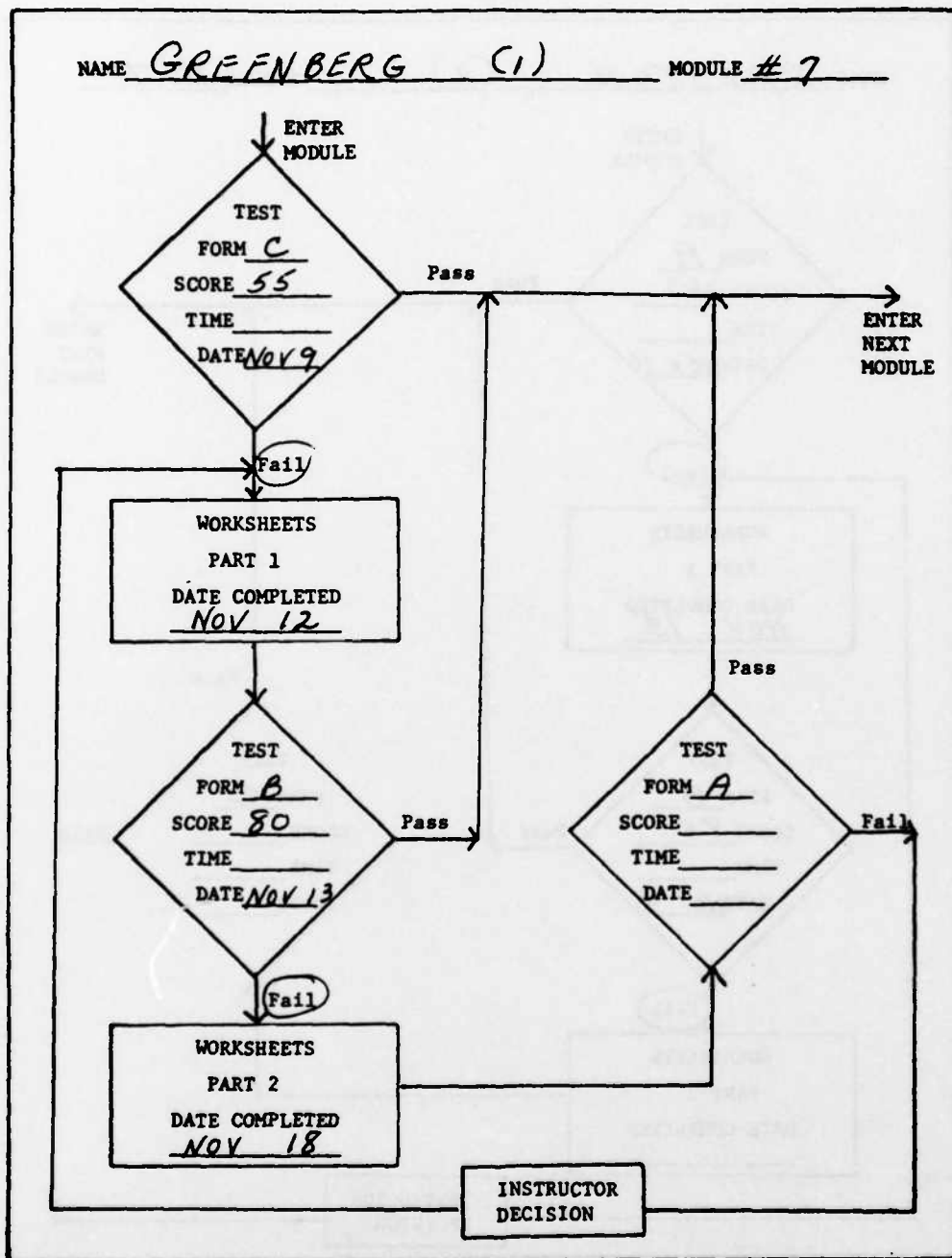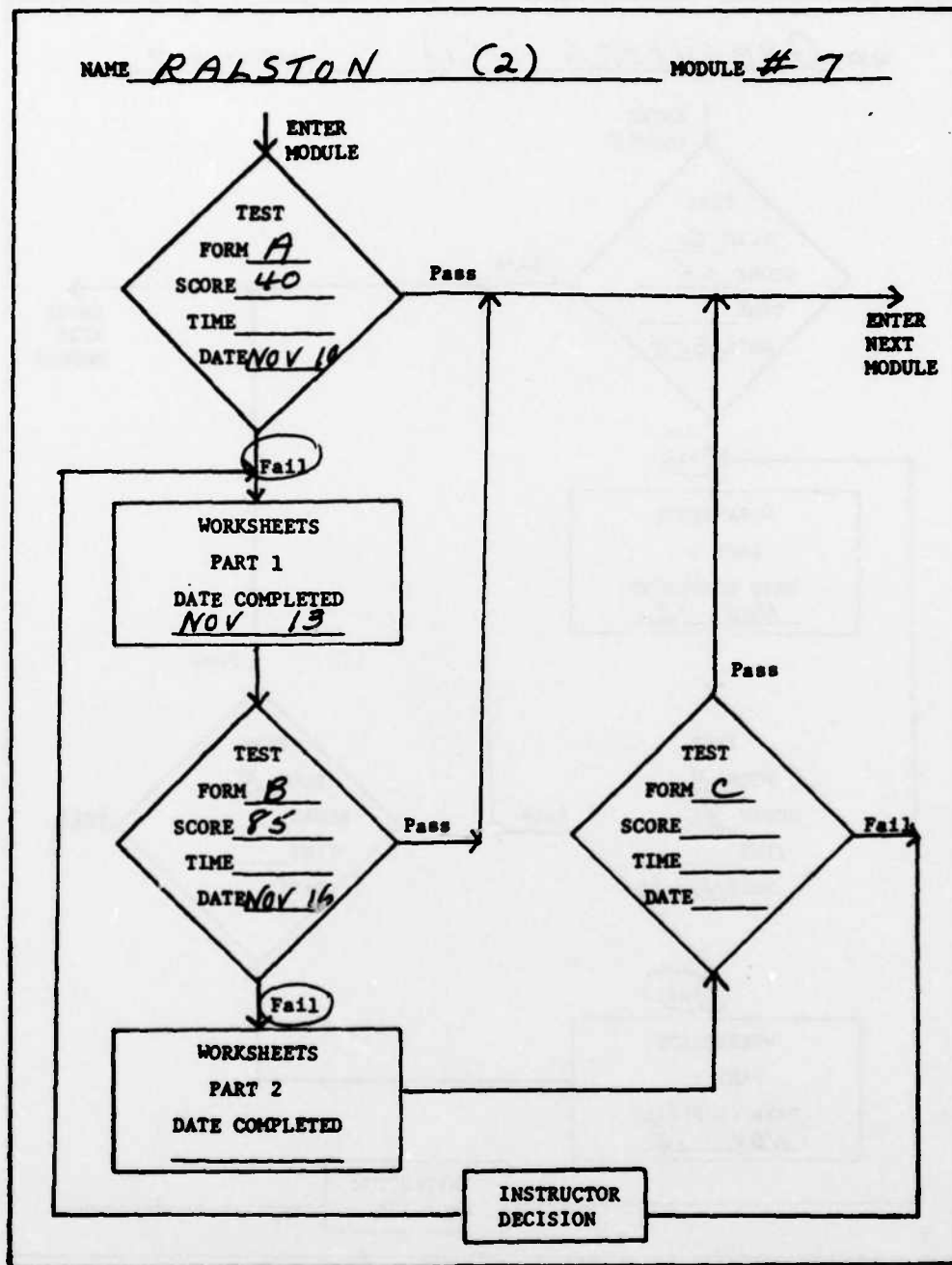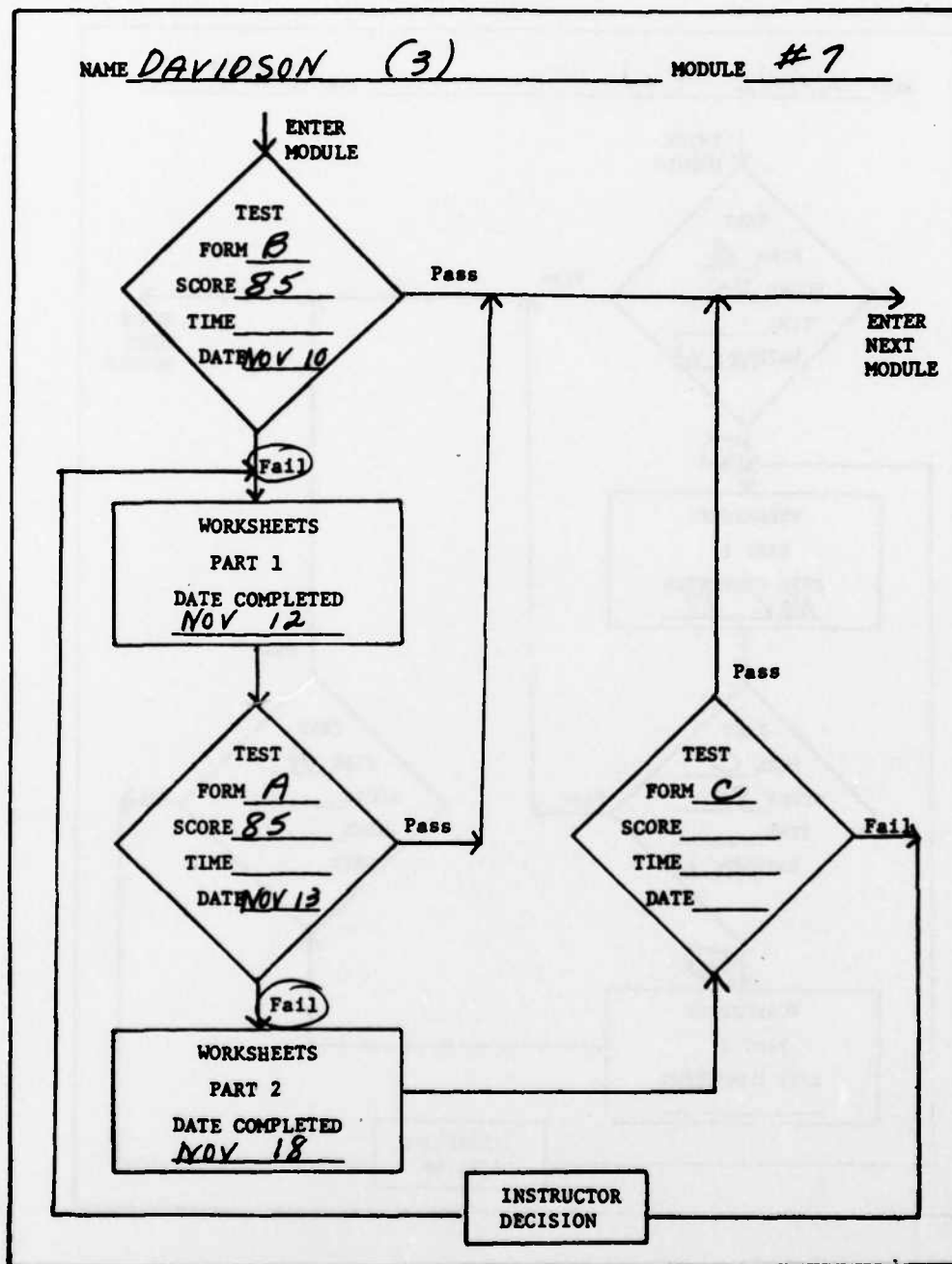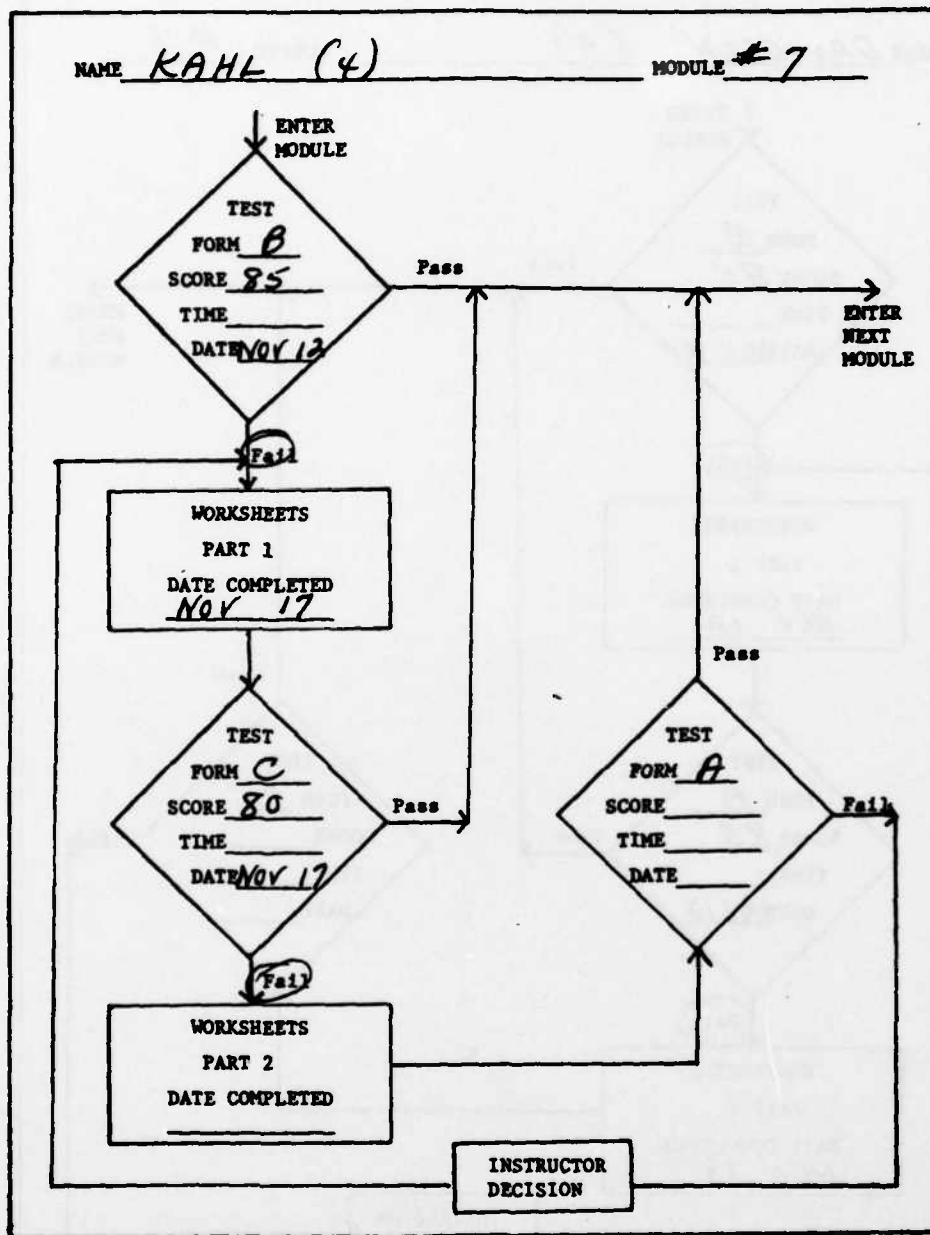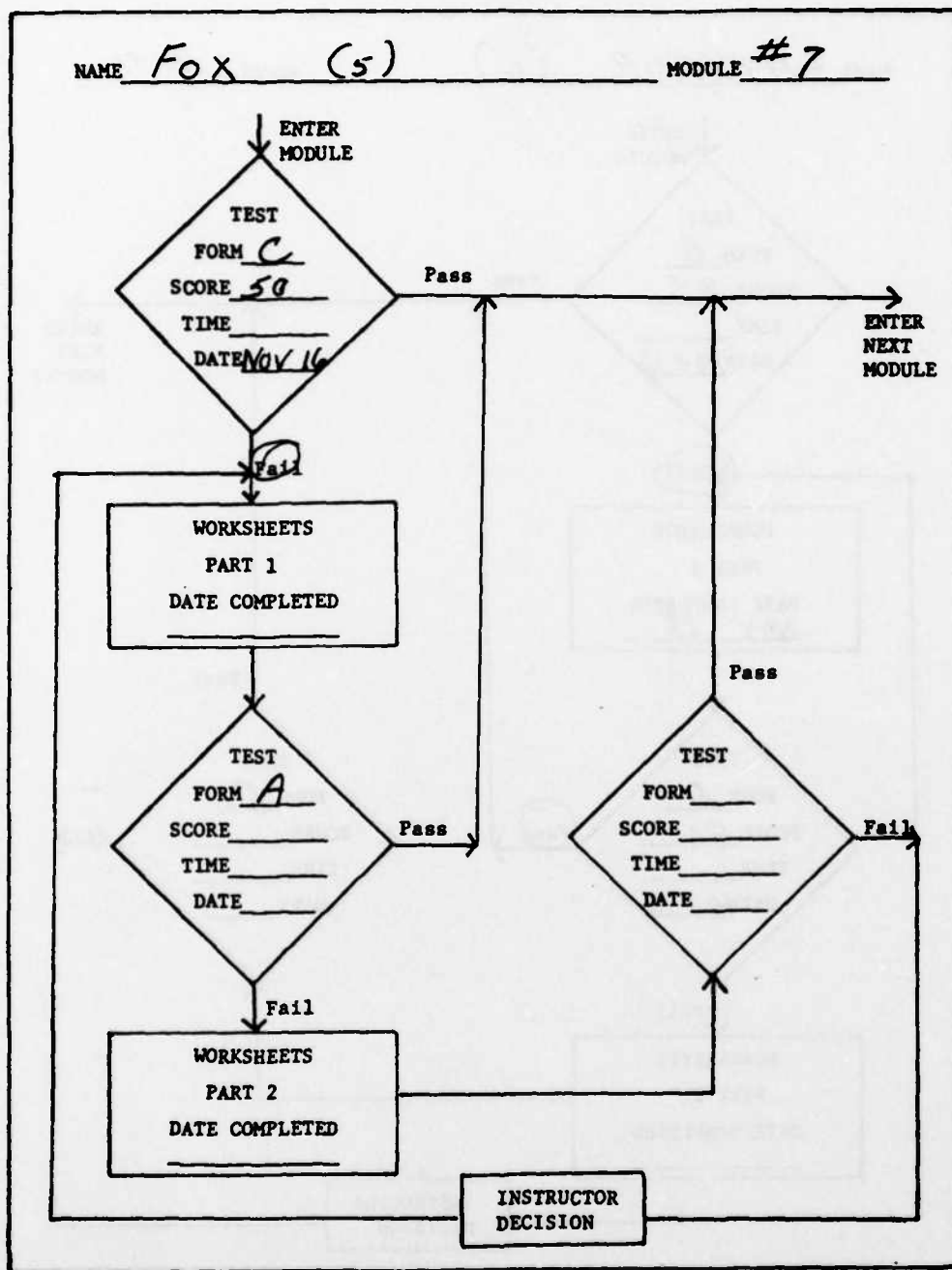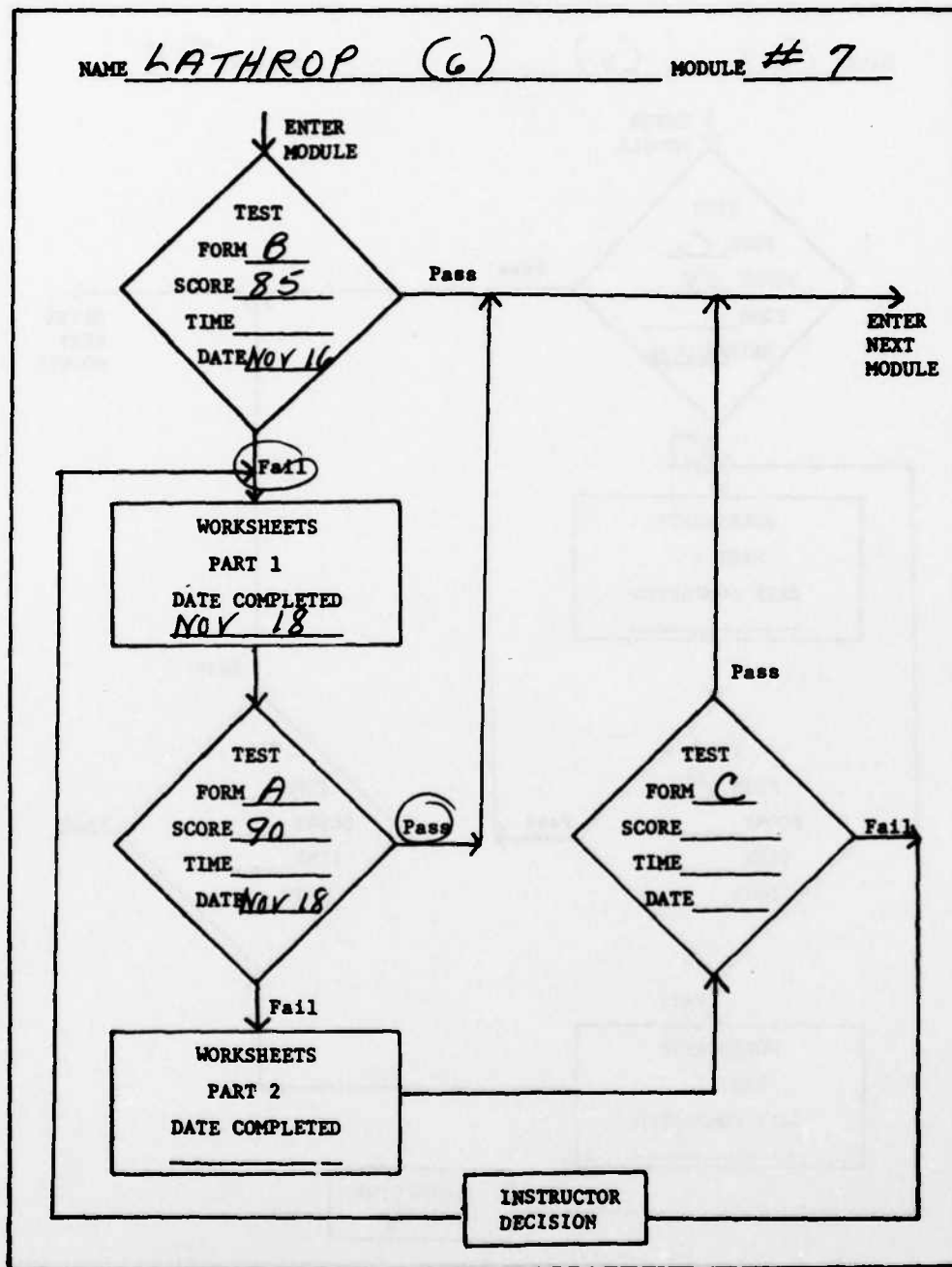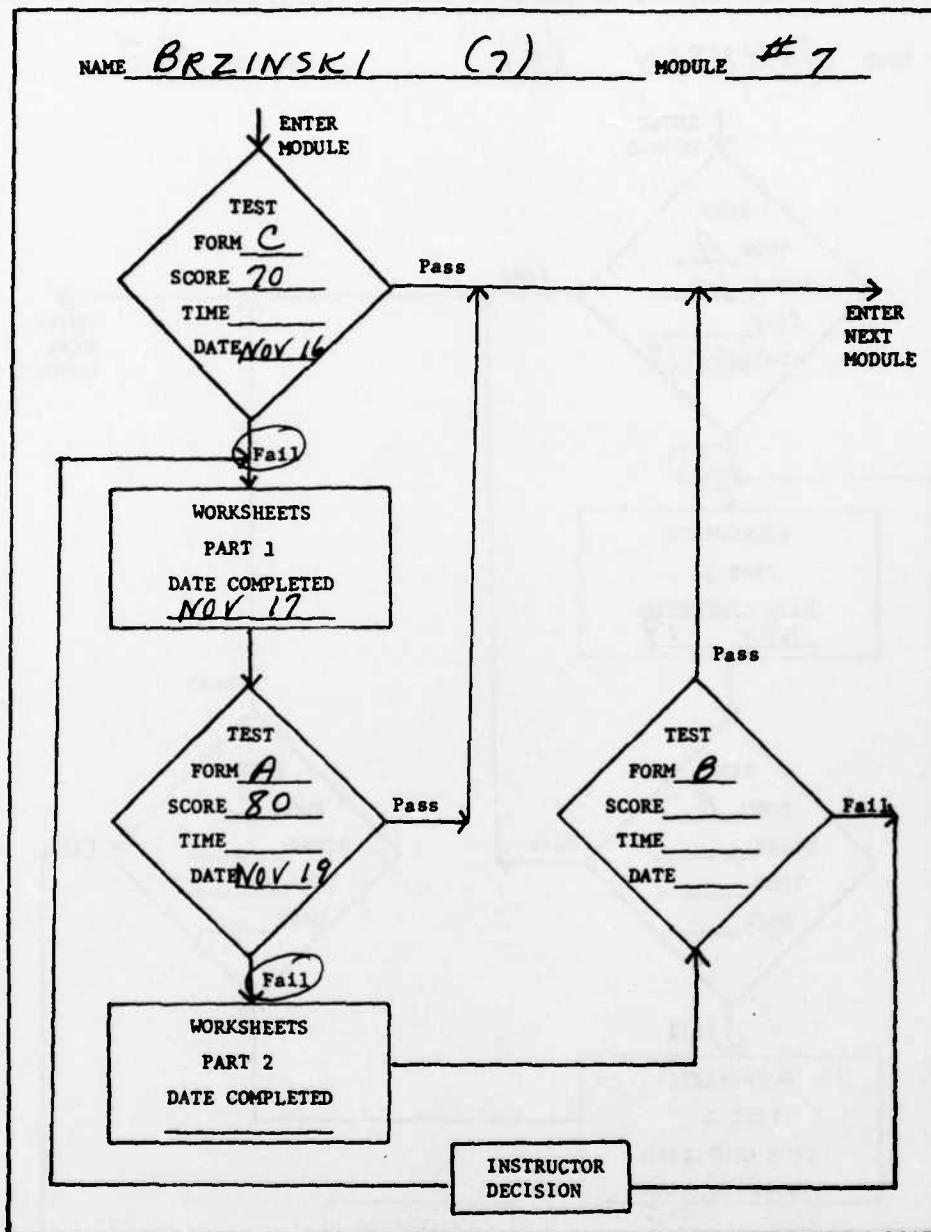TIME _____

DATE _____

INSTRUCTOR
DECISION
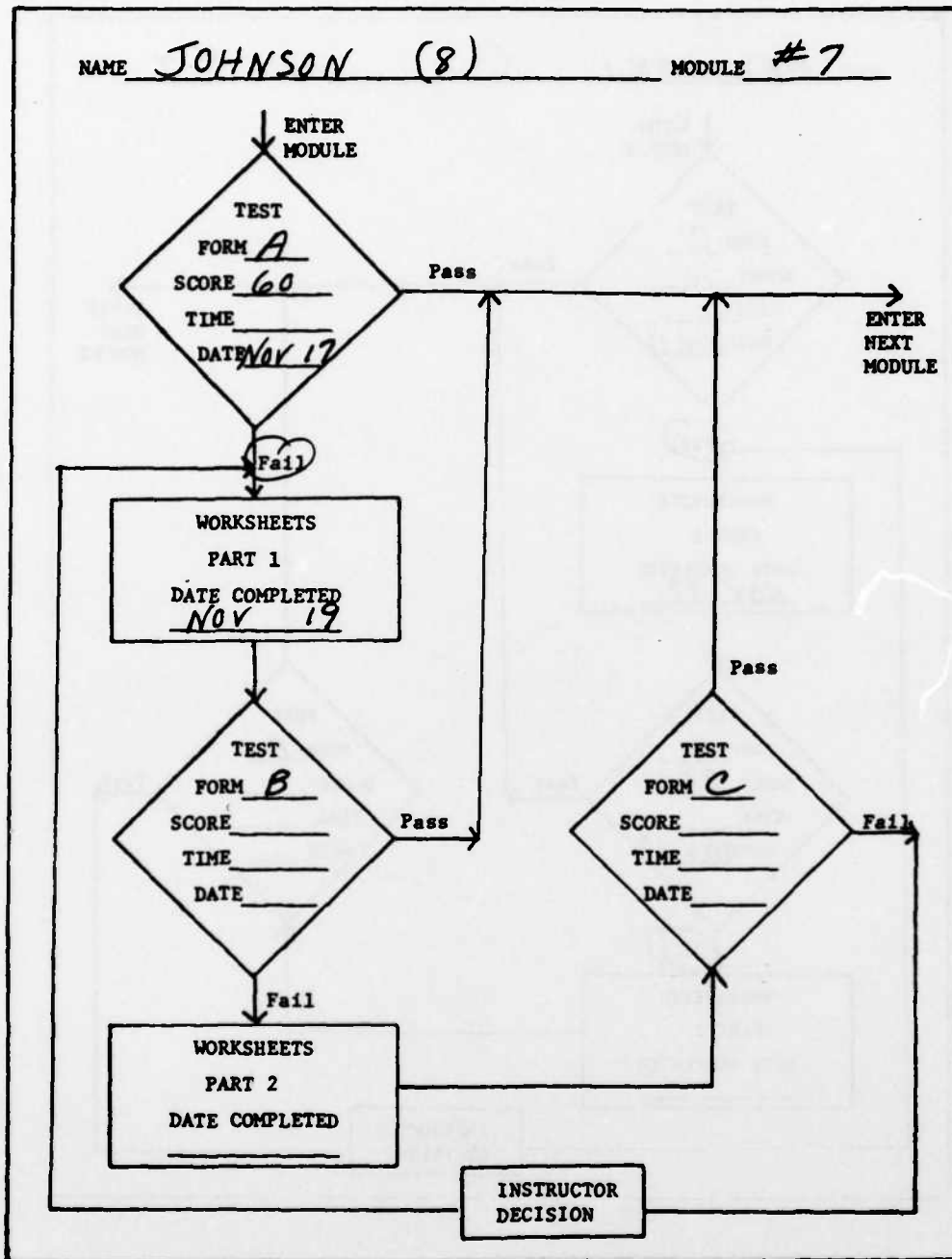
Figure A-8. Student progress card 8.
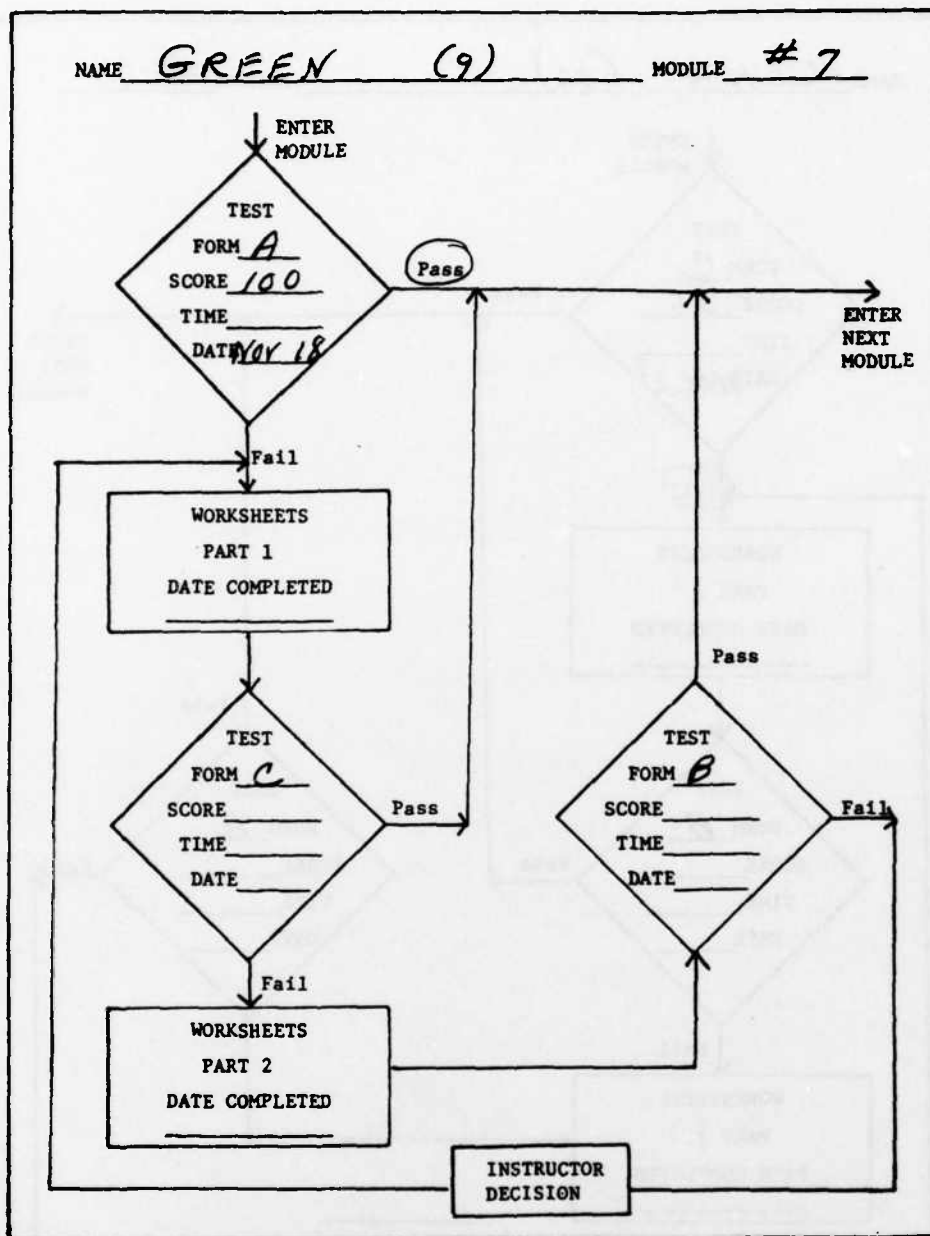
Figure A-9. Student progress card 9.
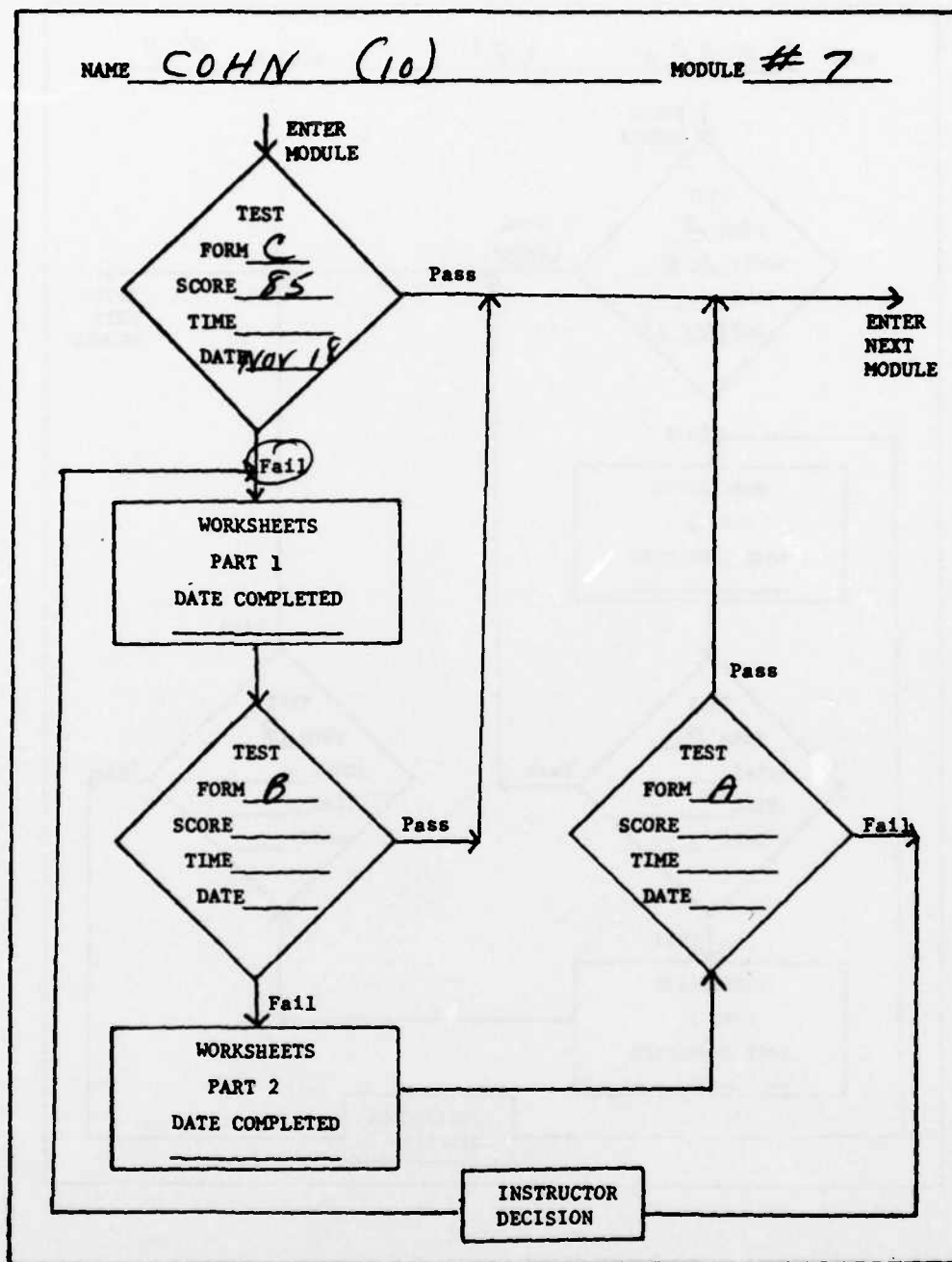
Figure A-10. Student progress card 10.

Answers (Chapter 5)

1. a. Separate important points.
    b. Identify important points.

The important point about the mayonnaise is separated by being indented and identified by the word note.

2. The text suggests six:

    a. Key point.
    b. Rule.
    c. Definition.
    d. Procedure for_____.
    e. Principle of_____.
    f. Main idea.

These are just suggestions. You may have thought of others.

3. One example of a mnemonic to remember the four types of amphibious operations is: "A wicked dentist returns" (AWDR).

4. The IQI gives six:

    a. Examples must be separated and identified.
    b. Examples must include some type of help.
    c. Examples should range from easy to hard.
    d. Examples should represent the job the student will do after training.
    e. There should be enough examples to cover the content area adequately.
    f. Examples should clearly show why common errors are wrong.

The first two rules are the same as those for presentations. You do not have to memorize these rules, but the more of them you keep in mind when you write your instruction, the less you will have to change later.

5. The IQI gives seven:

    a. The practice section must be separate and identified.

    b. The practice items must be free of hints that will not be present in the test or on the job.

    c. The practice items should have the same format as the format of test items.

    d. The practice items should range from easy to hard.

    e. The practice items should be typical of the job to be performed after training.

    f. The practice items should include the opportunity for common errors.

    g. The practice items must be followed by feedback.

6. d. Remember fact.

7. a. Use procedure (unaided). This is a use item because the student has to apply the general procedure to figure out the number for a particular inspection (the third one that day). It is unaided because statement of the rule is not stated for the student.

8. _a_ (1) Greenberg. Administer test form A. Greenberg finished her worksheets yesterday. She is ready for the test again.

_f_ (2) Ralston. Check regularly to see if Ralston can use assistance. He is working on worksheets, part 2.

_c_ (3) Davidson. Administer test form C. As Davidson finished worksheets, part 2, yesterday, he is ready for the test.

_f_ (4) Kahl. Kahl is in the same situation as Ralston--working on worksheets, part 2. Check regularly to see if he needs help.

_f_ (5) Fox. Fox is working on worksheets, part 1. Check regularly to see if she needs help, too.

_g_ (6) Lathrop. He passed (90%) the test for module #7 yesterday. Assign him to the next lesson.

_e_ (7) Brzinski. Since she failed to master the lesson test just now (today, 19 November), assign worksheets, part 2. (Of course, if you had already assigned part 2, your answer would be to check regularly to see if she needs help.)

_b_ (8) Johnson. He is ready for the test again, because he has just finished worksheets, part 1.

_g_ (9) Green. She has mastered this lesson; assign her to the next lesson.

_f_ (10) Cohn. Cohn is working on worksheets, part 1. Keep an eye on him to see if he needs help.

9. When you have finished your student progress card for your own course, explain it to your instructor. Then, have him or her sign off in the space provided in your study guide.

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6.0   THE ROLE OF EVALUATION

Evaluation is part of your instructional package because individualization makes large demands on evaluation. In individualized instruction, evaluation is a tool for affecting the student's performance. Tests are an active part of the instruction process, not just its end. Therefore, your evaluation system has to give the instructor and the student up-to-the-minute information on what to do next.

Study Questions (Chapter 6)

1. State at least two reasons to evaluate the individual performance of students.

a. _____

_____

b. _____

_____

2. Why is it important for test results to be available quickly in individualized instruction?

a. It is important for instructors to find out quickly who is the best student.

b. Test results help determine what a student studies next.

c. Individualized courses are shorter than traditional courses.

d. Tests themselves are usually shorter in individualized courses.

Answers (Chapter 6)

1. The text mentions four reasons:

   a. To see if training objectives (of skill and knowledge) have been met.
   b. To see what skills and knowledge a student still needs to acquire.
   c. To determine eligibility for special duty, special pay, etc.
   d. To evaluate units as a whole.

   You may have thought of other reasons to evaluate individuals (like initial selection into the service or classification to a job). If you are in doubt, show your answer to an instructor.

2. b.

7.0 PLANNING A TEST

Planning the test is the most important phase of the test development process. Chapter 7 aims to make you think about what you are trying to measure before you "plunge in."

<u>Study Questions (Chapter 7)</u>

1. Which is the best definition of the performance or content domain of a test?

   a. The set of all questions on a test.
   b. All of the knowledge and skill in a job.
   c. The hands-on portion of a skills test.
   d. The knowledge and skills that you want the test to measure.

2. True or false? The performance domain refers to job performance, never to school performance.

   a. True.
   b. False.

3. You want to evaluate each student's ability to lead a battalion landing team in an amphibious assault, but you do not have time or facilities for each student to participate in a landing. How could you test to see if your students have this ability?

   _____

   _____

4. You are a member of an evaluation team in the field. You are testing 25 Marines at random to see how well they can apply first aid for burns. What is the most reasonable explanation for such a testing program?

   a. You are interested only in how well those 25 Marines can perform today.

   b. You are interested only in finding out who knows the most about burns.

   c. You are interested in how Marines in general will be able to apply first aid if it is needed.

   d. You are interested only in finding out what those 25 Marines learned in training.

5. Of the following five methods for picking test items, which would usually be the simplest to carry out?

   a. Random sampling.
   b. Generality of content.
   c. Frequency.
   d. Performance characteristics.
   e. Criticality.

6. Generality of content can be used as a sampling strategy when:

    a.   You know that frequently performed tasks are important.
    b.   Information learned and job performance are not related.
    c.   You can determine the criticality of knowledge.
    d.   You can identify commonalities among the tasks that make up performance.

7. What is one reason to represent frequently performed tasks more heavily on a test?

_____

_____

8. You are planning a test. You have decided to select the tasks that take the longest time to learn. This is an example of sampling on the basis of:

    a.   Performance characteristics.
    b.   Frequency of performance.
    c.   Criticality.
    d.   Generality of content.

9. You are planning a test. You have decided to represent the tasks that are most important in terms of logistics. This is an example of sampling on the basis of:

    a.   Performance characteristics.
    b.   Frequency of performance.
    c.   Criticality.
    d.   Generality of content.

10. The form of test that is best for evaluating students depends mainly on:

    a.   The interests and aptitudes of the students in the class.
    b.   The kind of knowledge or skill you are measuring.
    c.   Whether you are sampling on the basis of criticality or frequency.
    d.   Whether you are evaluating for remediation purposes or diagnosis.

11. Select the best definition of a procedure:

    a.   A task that calls for a lot of judgment.
    b.   A task that calls for quick reflexes and strength.
    c.   A task that calls for following a set of directions.
    d.   A task that calls for remembering when to apply one rule and when to apply a different rule.

12. Enter either A or B below to show whether each of the following involves mostly application of a procedure (A) or a motor/perceptual skill (B).

    a.___ Pitching horseshoes.

    b.___ Hitting a target with a hand grenade.

    c.___ Preparing DD Form 4444.

    d.___ Starting a 1/4-ton vehicle.

    e.___ Performing preventive maintenance on a radio.

    f.___ Performing a parachute landing roll.

13. Check the statements below that involve mostly the application of a rule or principle.

    a.___ Filling out a payment voucher.

    b.___ Writing test items.

    c.___ Disassembling a rifle.

    d.___ Changing all spark plugs in a vehicle.

    e.___ Selecting the proper munition to employ in a tactical situation.

14. Which one of the following is most characteristic of problem solving and decision making?

    a.   The performer must follow very closely the rules given to him.
    b.   The performer must come up with rules of his own.
    c.   The performer must remember many rules at once.
    d.   The performer must follow a detailed procedure.

15. Match the characteristics in Column A with the form of test in Column B.

A Characteristics	B Test Form
a.___ Can maximize the amount of job information in a test.	(1) Paper-and-pencil.
b.___ More variation in scoring.	(2) Hands-on performance.
c.___ More likely to test unimportant knowledge.	
d.___ Automatically represents all knowledge needed to perform the task.	
e.___ Time consuming to administer.	

A-33

<u>Answers (Chapter 7)</u>

1. d.

2. b. False.

3. The text suggests two possible ways:

a. Test part of the student's proficiency. For example, you could develop a simulation of one aspect of battlefield communications and test each student on that ability.

b. Test part of the student's knowledge. For example, you could develop tests of knowledge of amphibious planning, command and staff actions, offensive operations, etc.

4. c.

5. a.

6. d.

7. The text gives one reason to represent frequent tasks more heavily: Frequent tasks are obviously important, because they are done so often. You may have thought of another. If you are in doubt, show your answer to an instructor.

8. a.

9. c.

10. b.

11. c.

12. a. __B__ Pitching horseshoes (skill).
    b. __B__ Hitting a target with a hand grenade (skill).
    c. __A__ Preparing DD Form 4444 (procedure).
    d. __A__ Starting a 1/4-ton vehicle (procedure).
    e. __A__ Performing preventive maintenance on a radio (procedure).
    f. __B__ Performing a parachute landing roll (skill).

13. a. _____ Filling out a payment voucher.
    b. __X__ Writing test items.
    c. _____ Disassembling a rifle.
    d. _____ Changing all the spark plugs in a vehicle.
    e. __X__ Selecting the proper munition to employ in a tactical situation.

14. b.

15. a. (1) (Paper-and-pencil)
    b. (2) (Hands-on)
    c. (1) (Paper-and-pencil)
    d. (2) (Hands-on)
    e. (2) (Hands-on)

8.0   CONSTRUCTING A TEST

Chapter 8 stresses that, for paper-and-pencil tests, you should start by developing a whole pool of items rather than just a single test. The best of the four types of items covered in the text is probably multiple-choice. Each of the others, however, has its own characteristics you should learn about.

The text points out that performance tests must be based on task analysis. Task analysis is taught at IMS and is not covered in this text. If you have not done the task analysis, you have nothing on which to base a performance test. In fact, paper-and-pencil tests are really based on task analysis too, because that is where training objectives come from in the first place.

Study Questions (Chapter 8)

1.   State one reason why even "performance" tests are not actually measures of performance.

_____

2.   State one reason why you should build a "pool" of test items before you construct a paper-and-pencil test.

_____

3.   One reason that free response test items are hard to score objectively is that:

    a.   Free response items have one-word answers.
    b.   Students may use different words for the same thing.
    c.   The student has to know exactly what answer to give.
    d.   Statements cannot be taken directly from text.

4.   What is the problem with using qualifying words such as never, always, exclusively, and sometimes in a true/false item?

    a.   They make statements always true or always false.
    b.   They make the test item unreliable.
    c.   Some students will not understand your meaning.
    d.   Some students "cue" on these words to figure out the right answer easily.

5. From the choices given below, choose the one that states what is wrong with this matching item:

Match each weapon in column A to the type of unit that predominantly uses it in column B.

A		B	
(b) (1)	Rifle	(a)	Artillery
(d) (2)	Sidewinder	(b)	Infantry
(a) (3)	8" howitzer	(c)	Headquarters
		(d)	Aviation

a. The lists of options are too short.
b. The elements in column A are not all of the same category.
c. The elements in column B are not all of the same category.
d. The basis for matching is not clear.

6. State (below) at least two rules to follow in writing multiple-choice items:

a. _____

_____

b. _____

_____

7. You should have your test items reviewed by another subject matter expert to make sure that they are clear and that the paper-and-pencil format is appropriate to what you are trying to measure. What is a third purpose of test review?

_____

_____

_____

8.   The two general types of scoring for performance tests are product-scoring and process-scoring. Which type is represented by the performance test below?

    a.   Product-scored.
    b.   Process-scored.

		GO	NO-GO
A.	Landed on balls of feet with knees bent slightly and feet together.	___	___
B.	Upon contact with mat:		
	Lowered chin to chest.	___	___
	Brought hands up in front of head with elbows in front of chest.	___	___
	Bent and twisted torso sharply to the right, forcing body into an arc.	___	___
C.	Rolled in the direction of drift (left) without hesitating on balls of feet.	___	___
D.	Touched left calf, left thigh, left buttock, and fleshy muscles in the left side of the back to mat in sequence.	___	___
E.	Brought feet around to right into line of drift.	___	___
F.	Maintained tension in neck throughout fall.	___	___

9.   This performance measure has a basic flaw. State what should be done to fix it.

        Surface must be free of grease and paint must be applied evenly.
                        _____GO   _____NO-GO

        _____

        _____

10.   Two possible aids to scoring hands-on tests are templates and diagrams. Name two other possible aids.

    a.   _____

    b.   _____

A-37

11. There are at least four things you need to tell the student before a hands-on test. Fill in the missing two below:

        a. State the job situation.

        b. _____.

        c. _____.

        d. State what help the student will get.

12. What is the maximum number of students that can be tested at one time in a process-scored hands-on test?

        a. 1.
        b. 2.
        c. 3.
        d. 4.

<u>Answers (Chapter 8)</u>

1. The text mentions two:

a. The person taking a "performance" test knows it is a test, not a real work situation.

b. A performance test cannot include everything that occurs in real job performance.

You may have thought of other ways, too, such as the fact that a performance test is given under the same conditions every time, while job performance may occur under many conditions. If you are in doubt, show your answer to an instructor.

2. The text gives three reasons:

a. An item pool gives you enough items to diagnose what a student is doing wrong.

b. An item pool gives you items for building more than one test form.

c. An item pool gives you enough extra items so you can discard poor items during tryouts and still have enough left for a test.

You may have thought of other good reasons to build an item pool, such as "juggling" items from test to test to improve test security. If you are in doubt, show your answer to an instructor.

3. b. The instructor must interpret the answers when students use different words for the same thing.

4. d.

5. c. The "extra" element in column B--headquarters--is obviously not a combat arm as are the others.

6. The text mentions five:

a. Several persons should agree about the correct answer.
b. Do not use negatively stated items.
c. Use "believable" distractors.
d. Do not use overlapping responses.
e. Randomize the location of the correct response.

7. To ensure that the item is relevant to the job.

8. b. This is a set of process-scored measures, because the scorer is watching to see how each step of the task is performed.

9. This performance measure should be split into two measures, because it now has two elements to check:

      a.   Was the surface clean?
      b.   Was the paint even?

The scorer should be able to indicate easily if the student performed one action but not the other.

10. The text mentions three others:

      a.   Overlay.
      b.   Photograph of correct product.
      c.   Photograph of faults.

You may have thought of others, such as a model of the correct performance. If you are in doubt, show your answer to an instructor.

11.   b.   State what the student is to do.
        c.   State the time and/or accuracy limits.

12.   Only one student can be tested at a time in process-scoring, because the scorer has to watch him or her the whole time.

9.0   TEST TRYOUT AND IMPLEMENTATION

The procedures for trying out your tests are different for paper-and-pencil tests and hands-on tests. The first exercise gives you practice in the expert tryout phase for a paper-and-pencil test. Remember that you are trying to locate faulty test items.

Study Questions (Chapter 9.0)

Paper-and-pencil Tests: Expert Tryout

Practice Situation. You are trying out a paper-and-pencil test with three experts: Murtaugh, Alston, and Stengal. Table A-1 presents the expert tryout questionnaire and a summary of answers. Two of the experts (Murtaugh and Alston) passed all the items. One expert (Stengal) failed one item (#5).

Table A-2 presents suggested actions you could take if experts find a test item is not acceptable. The actions in this table are keyed to the eight questions on the expert tryout questionnaire presented in Table A-1. (This table is only a guide. When you try out your paper-and-pencil tests with experts, you still have to ask them questions about the test.)

Your Task. Look over Table A-1. Then, use the suggestions on Table A-2 to help you answer the questions below.

1.   Are any items questionable? Which ones?

_____

_____

2.   Should you interview anyone? Whom?

_____

_____

3.   Do you think you will need to revise the item(s)? How?

_____

_____

Table A-1

Expert Tryout Questionnaire with Experts' Answers

		Answers Given by Expert		
	Expert Tryout Questionnaire	Murtaugh	Alston	Stengal
1.	Do you think you answered each item correctly? A. Yes. B. No. C. Not sure. (Go to 4) (Go to 2) (Go to 3)	A	C	A
2.	Which items do you think you did not answer correctly?	--	--	--
3.	Which items are you unsure about?	--	3 & 5	--
4.	Is this test realistic? (Does it reflect how the job is done?) A. Yes. B. No. C. Not sure.	A	A	B
5.	Were the words or phrases in the test easy to understand? (If "No," indicate in the space below the words or phrases that gave you trouble.) A. Yes. B. No. C. Not sure.	A	A	B Item 5, "Activate secondary firing device."
6.	Are all of the alternatives to each item believable? (If "No," indicate the alternatives that are not believable.) A. Yes. B. No. C. Not sure.	A	A	B Item 5, the gunner would not really be able to reach the charging handle.
7.	Are all of the items relevant to the job? (If "No" or "Not sure," indicate which items should be deleted.) A. Yes B. No. C. Not sure.	A	B Item 3, the rammer is not used in combat.	A
8.	As the test is now written, do you think it is a fair measure of a Marine's ability to perform on the job? A. Yes. B. No. C. Not sure.	A	A	C

Table A-2

Suggested Actions if Test is Not Acceptable to Experts

Question No.	Expert's Answer		Possible Actions
1	B or C	a.	Check that answer is correct.
		b.	Check "wrong" alternatives are incorrect.
		c.	Rewrite stem.
		d.	Rewrite situation.
		e.	Rewrite alternatives.
2			N/A
3			N/A
4	B	a.	Check that answer is correct.
		b.	Add illustration.
		c.	Rewrite situation.
		d.	Consider hands-on testing.
5	B	a.	Rewrite entire item.
		b.	Add illustration.
6	B	a.	Change unbelievable alternatives.
7	B	a.	Delete entire item.
		b.	Rewrite situation.
8	B or C	a.	Probe for more information on preceding questions.

Note. See Table A-1 for questions with answer keys.

Paper-and-pencil Test: Validation

The next practice exercise is on the validation phase of a paper-and-pencil test. Remember that you are trying to find test items that do not separate masters from nonmasters. Simply compute the agreement index for items 1 through 3, based on the test item scores on the Figure A-11. (You will need to make a 4-way table for each item, like that shown in Figure 9-3.)

4. Agreement index for item #1 = _____.

5. Agreement index for item #2 = _____.

6. Agreement index for item #3 = _____.

7. Which item(s), (if any), must be revised because the agreement index was to low?

    a. Item 1 only.
    b. Item 2 only.
    c. Item 3 only.
    d. Items 1 & 2.
    e. Items 2 & 3.
    f. Items 3 & 4.
    g. All items.
    h. No items.

Hands-on Test: Expert Tryout

Next, you will practice locating defects in hands-on tests on the basis of the expert tryout. Remember that you are trying to find faulty performance measures.

You would use the following procedure for the expert tryout phase of a hands-on test: (1) locate five experts, (2) pick two to score the test, (3) have them score the remaining three experts, and (4) administer a questionnaire. This resulting information will indicate possible defects in doctrine, performance measures, or test conditions.

The first defect you would look for is an expert's failure to do a performance measure as required by the test. If both scorers agree that an expert failed a performance measure and the expert insists he is right, the test might conflict with doctrine. You would revise the performance measure or test conditions so that the examinee and scorers agree that the test conforms with doctrine.

The second defect you would look for is disagreement between the scorers on a performance measure. If scorers disagree, your test might have an unclear or unobservable performance measure. You would need to rewrite the performance measure or change the test conditions.

The third defect you would look for is unacceptability. You would have the experts answer the hands-on test questionnaire to get their opinions about the relevance of the task and the fairness of the measurement.

NAME	M/N	1	2	3	4	5	6	7	8	9	10
1. Thompson	M	P	P	P							
2. Orr	N	F	F	P							
3. Silberstein	N	P	P	P							
4. Baker	N	F	F	F							
5. Bushey	M	P	P	P							
6. Navari	N	F	F	F							
7. Brooks	M	F	F	F							
8. Munson	N	F	P	P							
9. Kocher	N	F	P	P							
10. Keillor	N	P	F	P							
11. Risko	M	F	F	F							
12. Contreras	N	F	F	F							
13. Howe	M	P	P	P							
14. Clark	N	P	P	P							
15. Duffy	N	F	F	F							
16. von Haseln	M	F	P	P							
17. Edwards	N	P	P	P							
18. Aversano	N	P	F	P							
19. Lobay	M	F	F	F							
20. Sharp	N	P	P	P							
21. Vineberg	M	P	P	P							
22. Caylor	N	F	F	P							
23. Sticht	N	P	F	P							
24. McGuire	M	F	P	P							
25. Huff	M	P	P	P							
26. Flyer	N	F	F	F							
27. Taylor	N	F	F	P							
28. Sheridan	M	F	P	F							
29. Washington	M	P	P	F							
30. Lafayette	N	F	F	P							

Figure A-11. Test item scores for exercise on validation phase of paper-and-pencil test.

A-45

Practice Situation. During the expert tryout of a hands-on test, both scorers gave the expert a NO-GO. The expert who was tested gave these answers on the hands-on test questionnaire (Fig. 9-4):

		Yes	No
1.	Is the task covered by the test a job requirement?	X	____
2.	Does the test provide a fair measure of job requirements?	X	____

Your Task. Look over the questionnaire responses (above) and the completed score sheets in Figure A-12. Decide whether this test has any likely defects. If it does. also answer question 9.

8. Does this test have any likely defects?   Yes   No

9. If so, what is the defect?

    a.   Conflict with doctrine?   Yes   No
    b.   Unclear or unobservable performance measure? Yes   No
    c.   Unacceptable to expert?   Yes   No

Scorer 1

Task: Prepare an M72A2 LAW for firing; engage targets.

Performance Measures	Pass	Fail
1. Removes sling assembly and extends the LAW until locked in position.	X	___
2. Places LAW on shoulder with front end of LAW toward the target.	X	___
3. Checks back blast area before arming LAW.	X	___
4. Arms LAW (by pulling safety handle out) and simulates firing the weapon (by pressing the trigger until it clicks) with weapon on shoulder.	___	X
5. Completes all performance measures in 30 seconds.	X	___
If all performance measures are checked pass, mark GO. If any performance measure is checked fail, mark NO-GO.	GO ☐	NO-GO ☒

Scorer 2

Task: Prepare an M72A2 LAW for firing; engage targets.

Performance Measures	Pass	Fail
1. Removes sling assembly and extends the LAW until locked in position.	X	___
2. Places LAW on shoulder with front end of LAW toward the target.	X	___
3. Checks back blast area before arming LAW.	___	X
4. Arms LAW (by pulling safety handle out) and simulates firing the weapon (by pressing the trigger until it clicks) with weapon on shoulder.	X	___
5. Completes all performance measures in 30 seconds.	X	___
If all performance measures are checked pass, mark GO. If any performance measure is checked fail, mark NO-GO.	GO ☐	NO-GO ☒

Figure A-12. Experts' score sheets for hands-on test expert tryout.

Hands-on Test: Validation

Finally, in this last exercise, you will practice handling validation data from hands-on tests. Remember that you are trying to see if experts agree when they score students on the test. You will use five students and four scorers.

Practice Situation. A hands-on test has just been scored by four scorers. Here are the results for each of the five students who took it:

Scorer

	1	2	3	4	
1	P	P	P	F	P = Pass
2	P	P	P	P	F = Fail
Student 3	F	F	F	F	
4	F	F	F	F	
5	P	P	P	P	

Your Task. Compute the scorer agreement for the test results above. Use the table below to record agreement (A) or disagreement (D) for each pair of scorers for each student.

Scorer Pair

Student		1&2	1&3	1&4	2&3	2&4	3&4	Total Agree (A)	Total Disagree (D)
	1								
	2								
	3								
	4								
	5								

10. The scorer agreement for this test is _____ percent.

Compute scorer agreement for these test results:

		Scorer			
		1	2	3	4
	1	F	F	F	F
	2	P	F	P	F
Student	3	P	P	P	P
	4	P	P	P	P
	5	F	P	P	F

11. The scorer agreement for this test is _____ percent.

Evaluation Implementation

12. When you are using two forms of the same test in your course, the best practice is to:

    a. Use form A as a pretest and form B as a mastery test.
    b. Use form A both as a pretest and as a mastery test.
    c. Switch back and forth between A and B for pretest and mastery test.
    d. Use form A as a mastery test only.

13. Which of the following is a good rule to follow in revising the answer keys to your test?

    a. Do not revise any key for the first 3 months of the course.

    b. Do not revise the key without the agreement of at least one other instructor.

    c. Do not revise the key at all.

    d. Do not revise the key unless 80 percent or more students fail to master the objectives.

14. What is the best practice when scoring tests?

    a. Grade "easy."
    b. Grade "hard."
    c. Grade the same way for all students.
    d. Grade according to student's individual characteristics.

Answers (Chapter 9)

        1.   Items 3 and 5 are questionable. Any item that an expert fails is questionable; therefore, there is no doubt about item 5 since Stengal failed it. You should also follow up on any item that an expert is unsure about, which in this case means item 3, based on Alston's response on the questionnaire (Table A-1).

        2.   You should interview Alston (about items 3 and 5) and Stengal (about item 5). Even if an expert does not indicate a specific weakness in an item, interview him if he selects answers B or C to item 5.

        3.   Be prepared to do any of the following (listed in no particular order) to item 3.

            a.   Rewrite situation.
            b.   Rewrite stem.
            c.   Rewrite alternatives.
            d.   Add likely incorrect alternative(s).

        Be prepared to do any of the following, listed in order of probability, to item 5.

            a.   Check that the alternative Stengal chose is incorrect.
            b.   Rewrite stem.
            c.   Rewrite situation.
            d.   Rewrite alternative.
            e.   Check that correct alternative is correct.

        4.   24. $(6 \times 11) - (7 \times 6)$.

        5.   90. $(9 \times 12) - (6 \times 3)$.

        6.   -30. $(7 \times 5) - (13 \times 5)$.

        7.   c.   Only item 3 must be revised.

        8.   Yes. Defects are indicated by the scorer disagreement on performance measures 3 and 4.

        9.   The most likely defect is unclear or unobservable performance measures. There may also be a conflict with doctrine. But you need to revise the test so that scorers can agree on what happened before you can determine whether what happened conforms to doctrine.

10. The scorer agreement for this test is 90 percent (27 ÷ 30), which is an acceptable level. Your table should look like this:

Scorer Pairs

		1&2	1&3	1&4	2&3	2&4	3&4	Total Agree (A)	Total Disagree (D)
	1	A	A	D	A	D	D	3	3
	2	A	A	A	A	A	A	6	0
Student	3	A	A	A	A	A	A	6	0
	4	A	A	A	A	A	A	6	0
	5	A	A	A	A	A	A	6	0
								27	3

11. 73-1/3 percent. (Unacceptable)

12. c.

13. b.

14. c. Save the individualization for the instruction phase of your system.

APPENDIX B

TEST FORMS A AND B

TEST FORM A

1. Which one of these most distinguishes an individualized system of instruction from nonindividualized systems?

    a.   It uses audiovisual media to instruct students.
    b.   It treats students differently according to performance.
    c.   It is based on training.
    d.   It uses pass/fail grading.

2. Classify the following hypothetical instruction system as individualized or nonindividualized: "Students enter the course at various times of the week. A student views a series of videotaped presentations on first aid. When a student has seen each videotape presentation twice, he or she is graduated."

    a.   Individualized.
    b.   Not individualized.

3. Which one of the following is a basic foundation of individualized instruction?

    a.   Differences among students will cause them to learn at different rates.
    b.   The lecture is the most important instructional technique of any course.
    c.   A wide variety of media are essential to training any group of students.
    d.   All students should reach the same level of achievement in the same amount of time.

Classify the instruction systems described in items 4 through 8 by checking either "Fixed" or "Variable" for each factor listed.

4. All students attend the daily lecture on "Examples of Leadership." The class then breaks into conference groups to discuss the lecture. After lunch, students complete written exercises in a workbook on leadership and management techniques. Students who have completed all exercises in the workbook take a test on the following day. Each objective covered on the test is scored pass/fail. The student who pass the test graduate; those who do not complete tape/slide exercises on the objectives they have failed and then retake the test.

	Fixed	Variable
Content	____	____
Time	____	____
Method	____	____
Achievement level	____	____

5. Each student entering the course is given from 7 to 15 workbooks to study, depending on the duties involved in his or her job assignment. Each workbook covers a different set of tasks. As soon as the student has passed a test for one workbook, he or she begins the next and continues in this way until all assigned workbooks have been completed. Any student who fails a workbook test studies the workbook and retakes the test until he or she has attained the passing score.

	Fixed	Variable
Content	———	———
Time	———	———
Method	———	———

6. All students study the same text using the questions in a study guide to check their progress. As soon as they finish a chapter in the study guide, they take a test for that chapter. Students who pass the test advance to the next chapter and, when all chapters have been completed, they graduate from the course. Any student who fails a chapter test must restudy the chapter and retake the test until he or she passes it.

	Fixed	Variable
Content	———	———
Time	———	———
Method	———	———
Achievement level	———	———

7. There are eight modules in the course and, for each module, there are two sets of worksheets. As soon as a student has completed all worksheets in Set 1 for a module, he or she is tested. A student who passes the test advances to the next module, but a student who fails the module test completes all worksheets in Set 2 before being tested again. A student is graduated from the course as soon as he or she has passed all eight modules.

	Fixed	Variable
Content	———	———
Time	———	———
Method	———	———
Achievement level	———	———

8. The course consists of 27 hands-on performance test stations. To prepare for each performance test, each student practices with a peer or buddy. As soon as a student has passed a performance test, he or she begins to train for the next test. When all tests have been passed, the student is graduated from the course.

	Fixed	Variable
Content	———	———
Time	———	———
Method	———	———
Achievement level	———	———

9. Which one of the following is the best definition of an audiovisual medium?

    a. A system of individualized instruction.
    b. A type of programmed instruction.
    c. A way to present instruction.
    d. An alternative to videotape.

10. Which of the following can be allowed to vary in a single individualized system?

    a. Content and time only.
    b. Time and method only.
    c. Content, time, and method only.
    d. Content, time, method, and achievement level.

11. There are at least five functions that an instructor should perform in an individualized course. One of them is to give feedback. Name two others:

    a. _____.

    b. _____.

12. In an individualized course, what should an instructor do first if a student does not understand part of a lesson?

    a. Assign additional study.
    b. Switch to an alternate medium.
    c. Retest the student.
    d. Determine why the student does not understand it.

13. Which one of the following would provide the most effective feedback to a student?

    a. The correct answers to a set of practice questions.
    b. The percentage score on a practice test.
    c. A pep talk for making a good effort on a set of practice questions.
    d. A chance to do the exercise over again.

14. One of your students is reading the correct answers to some study questions. This is an example of:

    a. Evaluation.
    b. Student reponse.
    c. Feedback.
    d. Presentation.

15. One of your students is practicing converting simulated fire request information to firing data. This is an example of:

    a. Feedback.
    b. Student response.
    c. Presentation.
    d. Evaluation.

16. Student response must always be followed directly by which one of these parts of an instruction system?

    a.   Evaluation.
    b.   Feedback.
    c.   Presentation.
    d.   None of these.

17. Evaluation is particularly important in individualized instruction. Select the main role that tests play in an individualized system that they do not play in a lock-step system.

    a.   Tests determine what the student knows.
    b.   Tests are based on objectives.
    c.   Tests are graded pass/fail.
    d.   Tests control the student's progress.

18. Which one of the following is the basic pattern of instruction?

    a.   Presentation, evaluation, student response, feedback.
    b.   Student response, feedback, presentation, evaluation.
    c.   Presentation, student reponse, feedback, evaluation.
    d.   Student response, evaluation, presentation, feedback.

19. Two parts of the instruction are often repeated several times within the basic pattern. Which pair are they?

    a.   Evaluation and student response.
    b.   Student response and feedback.
    c.   Presentation and feedback.
    d.   Student response and presentation.

20. At some point in your system, you might use instructor decision as a way to determine what the student should do next. Which one of the following is a disadvantage of including instructor decision in your system?

    a.   The instructor is a poor judge of what a student needs to learn.

    b.   The instructor does not have enough information to decide what the student should do next.

    c.   The instructor should have a hands-off attitude in individualized instruction systems.

    d.   The instructor might be swamped by too many decisions to make in a short time.

21. A student in your class has just demonstrated mastery of part of your instruction. Which component of instruction should come next?

    a.   Presentation.
    b.   Evaluation.
    c.   Student response.
    d.   Restudy of the previous lesson.

22. One of your students has viewed all the presentations for a lesson, completed all the student activities, and has been evaluated. What should the next component of instruction be?

    a. Evaluation.
    b. Presentation.
    c. Student response.
    d. It depends on the results of the evaluation.

23. Situation: You are about to use the IQI in converting an existing course into an individualized course. You should first make sure that:

    a. Your presentations are consistent with your objectives.
    b. Your objectives are complete and correctly stated.
    c. Your test items are adequate.
    d. Your practice items are adequate.

24. To make sure your tests are consistent with your objectives, you could use the IQI to classify them first. One purpose of checking for consistency between test items and objectives is to make sure that:

    a. Tests are scored accurately.
    b. Objectives are clearly stated.
    c. The content being tested is the same as the content being taught.
    d. The content of the course is job-oriented.

25. Which one of the following is an IQI rule for constructing good test items?

    a. Items should not give away the answer to other items.
    b. Items should be very brief.
    c. Items should not use "scenarios."
    d. Items should ask for recall of information, not application.

26. You are developing an individualized course. You have determined that students will hand their exercises to a student grader, not to the instructor. Which of the following is the best way to get the student to do this?

    a. Have the instructor issue "daily reminders."

    b. Include this information in the student's instruction.

    c. Print this information on the student progress card that the instructor has at the control desk.

    d. Leave this decision up to the classroom instructor.

27. There is a good reason to provide space for start time and estimated completion time right on the student progress card. What is that reason?

    a. It will help the instructor know whether the student may be having problems.
    b. The student will fail the lesson if he completes it late.
    c. The instructor always should test at the end of the estimated completion time.
    d. This information determines which test form the student will be given.

28. Which of these is the best way to inform a student of how much time a lesson should take?

    a. Post a list of times on the bulletin board.
    b. Leave this to the classroom instructor's discretion.
    c. Print this information in the instructor's guide.
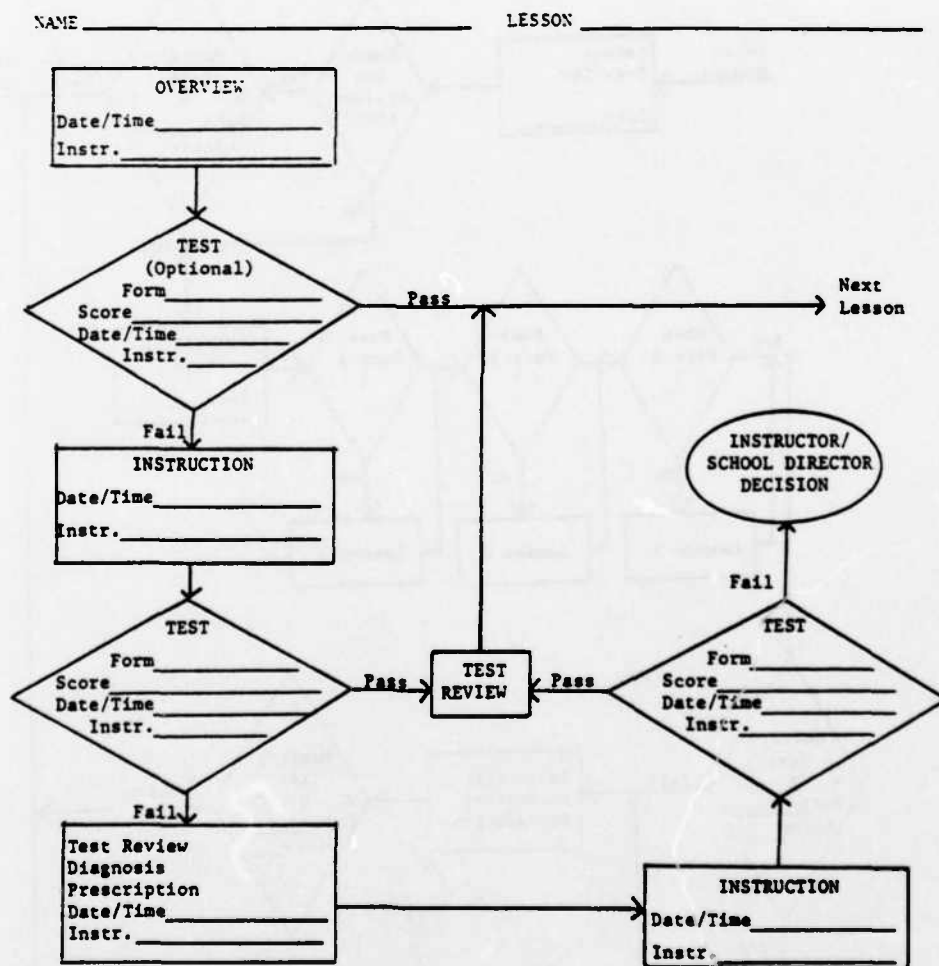   d. Include this information in the student's printed or audiovisual instruction.

29. In the system shown below, what will a student do after completing worksheets part 2?

    a. Enter next module.
    b. Take the module test.
    c. Be "recycled."
   d. It is the instructor's decision.
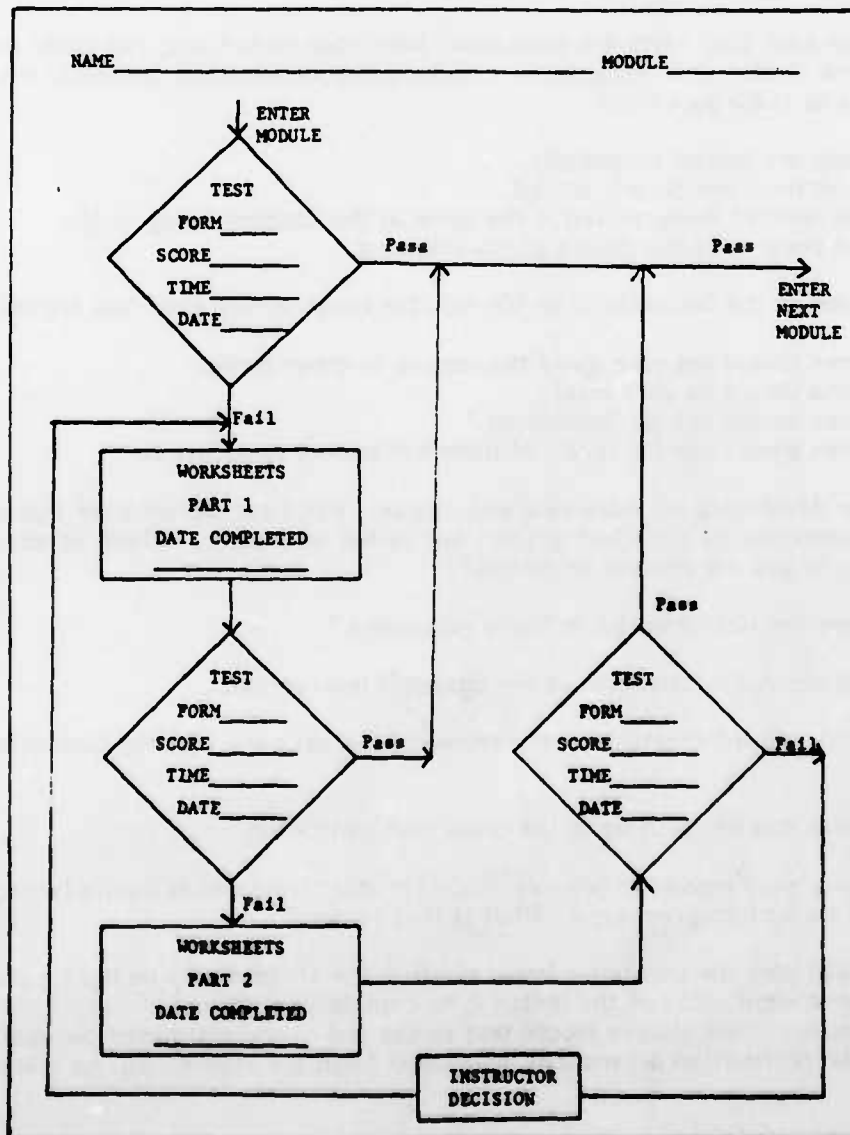
30. In the system shown below, what would a student do if he or she passed the test on the third try?

    a.   Receive more instruction.
    b.   Receive a diagnosis and prescription.
    c.   Go to the next lesson after test review.
    d.   It is the instructor's/school director's decision.

NAME _____   LESSON _____

OVERVIEW
Date/Time_____
Instr._____

TEST (Optional)
Form_____
Score_____
Date/Time_____
Instr._____

Pass → Next Lesson

Fail

INSTRUCTION
Date/Time_____
Instr._____

TEST
Form_____
Score_____
Date/Time_____
Instr._____

Pass → TEST REVIEW ← Pass

Fail

Test Review
Diagnosis
Prescription
Date/Time_____
Instr._____

INSTRUCTION
Date/Time_____
Instr._____

TEST
Form_____
Score_____
Date/Time_____
Instr._____

Fail

INSTRUCTOR/ SCHOOL DIRECTOR DECISION

31. In the system shown below, how many lesson(s) would a student take after the diagnostic test?

    a.   One.
    b.   Two.
    c.   Three.
    d.   It depends on the results.
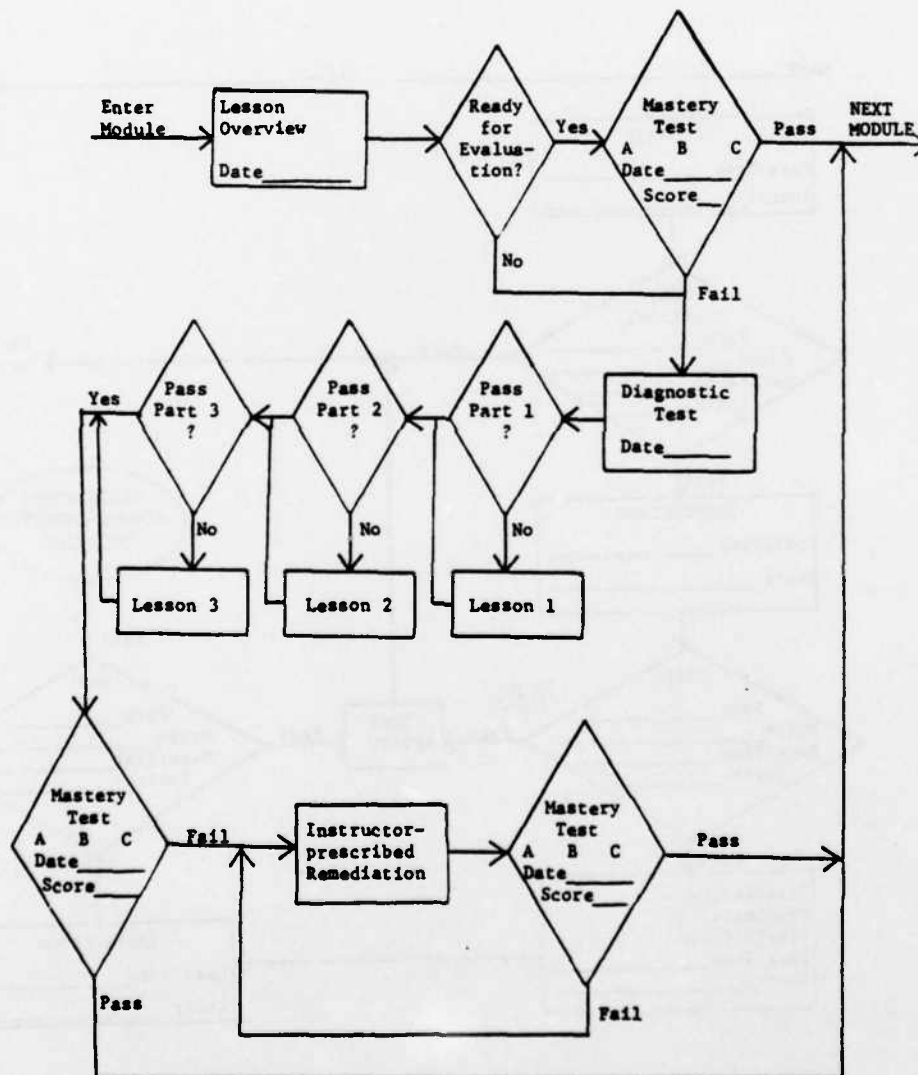
32. Which one of the following should you do first in the process of developing tests for your course?

    a.   Select a sampling strategy.
    b.   Determine the criticality of tasks.
    c.   Define the performance domain.
    d.   Sample on the basis of frequency.

33. Why is it necessary to sample the performance domain?

    a.   Not every element of performance can be represented on the test.
    b.   Some tasks in the performance domain of the test are not worth testing.
    c.   The performance domain is defined well enough.
    d.   Tests should include as few items as possible.

34. Which of the following test forms would be best for a motor skill?

    a.   Paper-and-pencil test.
    b.   Hands-on test.
    c.   There is no basis for choosing.
    d.   Neither is acceptable.

35. Of the following four methods for sampling the performance domain, which one requires identifying commonalities and/or dependencies among tasks?

    a.   Random.
    b.   Generality.
    c.   Frequency.
    d.   Criticality.

36. Which one of the following is one advantage of paper-and-pencil tests (over hands-on tests)?

    a.   They have lower reading demands.
    b.   They are more relevant to job performance.
    c.   They can cover more tasks.
    d.   They represent problem solving better.

37. Which one of the following is most characteristic of applying a rule or principle?

    a.   Recognizing hidden cues.
    b.   Using strength and good balance.
    c.   Remembering a step-by-step sequence.
    d.   Figuring out which rule applies.

38. Free response (fill-in-the-blank) test items can be used only when:

    a.   The question can be answered briefly, with a few words or sentences.
    b.   You are testing for remembering a fact.
    c.   The question concerns a rule or principle.
    d.   The question can be answered without looking at references.

39. True-false test items can be used only to test:

    a. Procedural tasks.
    b. Statements that are always true or false.
    c. Statements taken from textual material.
    d. Long and complicated statements.

40. One advantage that multiple-choice test items have over free response items is that multiple-choice items:

    a. Are less subjective to score.
    b. Are easier to construct.
    c. Can cover more tasks in a single test.
    d. Are harder for the student to guess at.

41. Read the following two sets of performance measures. Then, select the best answer:

    a. Both sets are product-scored.
    b. Both sets are process-scored.
    c. Only set 1 is product-scored.
    d. Only set 2 is product-scored.

SET 1:

A. Gave signal for ASSEMBLE. (At position of attention, raised arm vertically overhead, palm to the front, and waved in large horizontal circles.)

B. Gave signal for LINE FORMATION. (At position of attention, raised both arms to the side until horizontal with arms and hands extended and palms down.)

C. Gave signal for ATTENTION. (At position of attention, extended the arm sideways above horizontal, palm to the front, and waved arm to and away from the head several times.)

SET 2:

A. Stated known point as "From Registration_____."

B. Stated observer-target azimuth as "DIRECTION_____."

C. Stated lateral shift from known point, if any, as "RIGHT/LEFT_____."

D. Stated range shift from known point, if any, as "ADD/DROP_____."

E. Stated vertical shift from known point, if any, as "UP/DOWN_____."

---

42. One advantage of product-scoring is that:

    a. You do not have to test as many students.
    b. The most important tasks are product-scored.
    c. You can sometimes test more than one student at a time.
    d. There are fewer performance measures.

43. In which case should you indicate to the scorer whether the sequence of steps will be a scoring point in a hands-on test?

    a. Only when sequence will be scored.
    b. Only when some steps must be in order.
    c. In all hands-on tests.
    d. In no hands-on tests.

44. Which is the best description of how the test station should be set up for a hands-on test?

    a. A different way for every other student.
    b. At the discretion of the station test manager.
    c. At random.
    d. The same way every time.

45. What is one purpose for conducting an expert tryout of a paper-and-pencil test?

    a. To find test items that disagree with doctrine.
    b. To measure the average skill level of job experts.
    c. To see if the experts are good enough to serve as test scorers.
    d. To find test items that are easy to construct.

46. One purpose of validation of paper-and-pencil tests is to see if:

    a. Experts get all the items correct.
    b. The average score is passing.
    c. The test is long enough.
    d. The test can separate better performers from poorer performers.

47. One purpose of the validation of a hands-on test is to see if all performance measures are:

    a. Passed by every student.
    b. Equally difficult.
    c. Scored the same way by all scorers.
    d. Performed as fast as possible.

48. You have found that your students score an average of 12 points higher on form B of your lesson test than on form A. Which of the following methods is best for equalizing the two forms?

    a. Move items from one test to the other.
    b. Allow longer time for the harder test.
    c. Cut out some items from the harder test.
    d. None of these is acceptable.

49. Below are some data from the validation of a paper-and-pencil test. Compute the agreement index.

	Masters	Nonmasters
Pass	6	6
Fail	6	11

Formula: $(A \times D) - (B \times C) =$ Agreement index

Agreement index = _____ .

50. Below are some data from the validation of a hands-on test. Compute the scorer agreement.

		1&2	1&3	1&4	2&3	2&4	3&4	Total Agree(A)	Total Disagree(D)
	1	A	A	A	A	A	A	6	0
	2	A	D	D	D	D	A	2	4
Student	3	D	A	A	D	D	A	3	3
	4	A	A	A	A	A	A	6	0
	5	A	A	D	A	D	D	3	3

Scorer Pair

Scorer agreement = _____ percent.

Answer Key (Test Form A)

1. b.	17. d.
2. b.	18. c.
3. a.	19. b.
4. Fixed content.	20. d.
Variable time (to study).	21. a.
Variable method.	22. d.
Fixed achievement level.	23. b.
5. Variable content.	24. c.
Fixed time.	25. a.
Fixed method.	26. b.
6. Fixed content.	27. a.
Variable time.	28. d.
Fixed method.	29. b.
Fixed achievement level.	30. c.
7. Fixed content.	31. d.
Variable time.	32. c.
Fixed method.	33. a.
Fixed achievement level	34. b.
8. Fixed content.	35. b.
Variable time.	36. c.
Fixed method.	37. d.
Fixed achievement level.	38. a.
9. c.	39. b.
10. d.	40. a.
11. Any two of the following:	41. b.
(a) Give encouragement (motivation).	42. c.
(b) Diagnose problems.	43. c.
(c) Counsel.	44. d.
(d) Give direct instruction.	45. a.
12. d.	46. d.
13. a.	47. c.
14. c.	48. a.
15. b.	49. 30.
16. b.	50. 66-2/3 percent (or 67%).

TEST FORM B

1. Which one of the following is the best description of individualized instruction?

    a. Audiovisual media used to teach students individually.
    b. Systematic use of programmed texts.
    c. Instruction based on learning objectives and job performance.
    d. Treating each student differently on a systematic basis.

2. In most individualized instruction systems, how are instructional decisions made about individual students during the course?

    a. On the basis of aptitude scores at the beginning of the course.
    b. On the basis of reading ability tests.
    c. On the basis of performance during the course.
    d. On the basis of instructors' ratings of individuals' motivation.

3. Which one of the following is mentioned in your text as a disadvantage of live presentations over audiovisual presentations?

    a. Live presentations are usually based on incorrect information.
    b. Live presentations cannot be illustrated.
    c. Live presentations cannot cover an entire subject.
    d. Live presentations are not easily looked at again.

Classify the instruction systems described in items 4 through 8 by checking either "Fixed" or "Variable" for each factor listed.

4. Students select from two to six areas for individual study. For each area chosen, the students read a text book of 75-100 pages. After reading each textbook, they take a multiple-choice test. The students who fail the test restudy the textbook until they can pass the test. Then, they study the next area.

	Fixed	Variable
Content	____	____
Time	____	____
Method	____	____

5. Students each receive from 6 to 13 lesson workbooks to study, depending on which tasks they will be performing in the field. When they have mastered one lesson, they begin the next. To demonstrate mastery of a lesson, students must score 90 percent on a lesson test. Students who fail a lesson test must restudy the workbook and retake the test until they pass.

	Fixed	Variable
Content	____	____
Time	____	____
Method	____	____

B-14

6. Each student receives a copy of the course study guide and textbook at the start of the course. The student uses the study guide to prepare for a series of lesson or chapter tests. When the student has passed the test for one lesson, he or she advances to the next. A student who fails a lesson test restudies the study guide and the textbook and retakes the lesson test until passing it.

	Fixed	Variable
Content	_____	_____
Time	_____	_____
Method	_____	_____
Achievement level	_____	_____

7. The course materials consist of seven lesson tests and three sets of worksheets for each lesson. Each student begins each lesson by completing the first set of worksheets for that lesson. Then, the student is tested. If he or she passes the lesson test, the student begins the second lesson; if not, he or she completes the second set of worksheets; and, if he or she fails the lesson test again, the third set. The student must pass each lesson to complete the course.

	Fixed	Variable
Content	_____	_____
Time	_____	_____
Method	_____	_____
Achievement level	_____	_____

8. To complete the course, students must pass each of 16 hands-on performance tests. Students practice for the performance tests with a peer, another student who is at the same point in the course. As soon as a student has passed a performance test, he or she begins preparing for another one.

	Fixed	Variable
Content	_____	_____
Time	_____	_____
Method	_____	_____
Achievement level	_____	_____

9. Which one of the following is the best description of programmed instruction?

   a. A medium of communication.
   b. An individualized instruction system.
   c. An alternative to teaching machines.
   d. A method of conducting instruction.

10. Which of the following audiovisual media is the easiest to revise and update?

   a. Motion pictures.
   b. "Cue/see" filmstrip.
   c. Videotape.
   d. All three are equally easy to revise.

11. Which one of the following instructor functions is the most important in an individualized course?

   a. Grading multiple-choice tests.
   b. Diagnosing students' problems with the instruction.
   c. Cataloging instructional materials and audiovisual devices.
   d. Keeping records of students' rates of progress.

12. According to the text, an instructor should give feedback:

   a. In written form.
   b. Only after evaluation.
   c. During a test.
   d. Soon after the student's response.

13. Which one of the following is the basic pattern of instruction.

   a. Presentation, student response, feedback, evaluation.
   b. Presentation, evaluation, student response, feedback.
   c. Student response, feedback, presentation, evaluation.
   d. Student response, evaluation, presentation, feedback.

14. One of your students is completing a set of practice questions in a study guide. This is an example of:

   a. Evaluation.
   b. Presentation.
   c. Feedback.
   d. Student response.

15. One of your students is watching a videotaped demonstration of how to conduct an inspection. This is an example of:

   a. Presentation.
   b. Student response.
   c. Evaluation.
   d. Feedback.

16. One of your students is reading how a computer works. This is an example of:

    a. Student respose.
    b. Presentation.
    c. Evaluation.
    d. Feedback.

17. One of your students is listening to an instructor's comments about her analysis of British defense policy. This is an example of:

    a. Student response.
    b. Evaluation.
    c. Feedback.
    d. Presentation.

18. One of your students is practicing night compass reading. This is an example of:

    a. Student response.
    b. Evaluation.
    c. Presentation.
    d. Feedback.

19. One of your students is looking at the "school solution" to a problem in defensive operations. This is an example of:

    a. Student response.
    b. Evaluation.
    c. Feedback.
    d. Presentation.

20. According to the text, evaluation is particularly important in an individualized system, because in an individualized course:

    a. Training objectives are more difficult to achieve.
    b. Evaluation determines what a student will do next.
    c. Audiovisual media are often used.
    d. Presentations are not usually made by the instructor.

21. According to the instructional quality inventory (IQI) described in the text, which one of the following rules should you follow for the presentation part of your lessons?

    a. Use printed lessons rather than audiovisual lessons.
    b. Never present two important points in the same lesson.
    c. Separate important points from the rest of the lesson material.
    d. Repeat important points at least twice.

22. Which one of the following is an IQI rule for developing good test items?

    a. Items should always be short.
    b. Directions should refer to previous test items.
    c. Items should be arranged in order from easy to hard.
    d. Directions should not be ambiguous.

23. According to the IQI, you should classify your objectives, tests, and presentations to make them consistent. One reason to make these three elements consistent is:

    a. If these elements are not consistent, the course will be too short.

    b. When these elements are not consistent, students will tend to study the objectives only and not the presentations.

    c. If you teach a student one thing and test him on another, you may get poor results.

    d. Making sure these elements are consistent greatly reduces course development time.

24. In the individualized course you are planning, you have decided that a student may "challenge" the lesson test at any time. Which one of the following is the best way to let the student know this?

    a. Remind the instructors daily to remind all students of this rule.
    b. Leave this matter up to the classroom instructor.
    c. Include this information in each lesson the student studies.
    d. Print this rule in the instructor's guide.

25. In an individualized instruction system, group activities:

    a. Can be scheduled for a regular time in advance.
    b. Are not appropriate.
    c. Are difficult to schedule and to manage effectively.
    d. Should not be necessary.

26. Suppose you are developing a course in which the passing score for lessons 1 through 4 is 90 percent and the passing score for lessons 5 and 6 is 85 percent. Which of the following would be the best way to communicate this to the instructor?

    a. Print this information in the instructor's guide.
    b. Post a notice about this in the instructors' office.
    c. Print the passing score on the student progress card for each lesson.
    d. Leave this matter up to the classroom instructor.
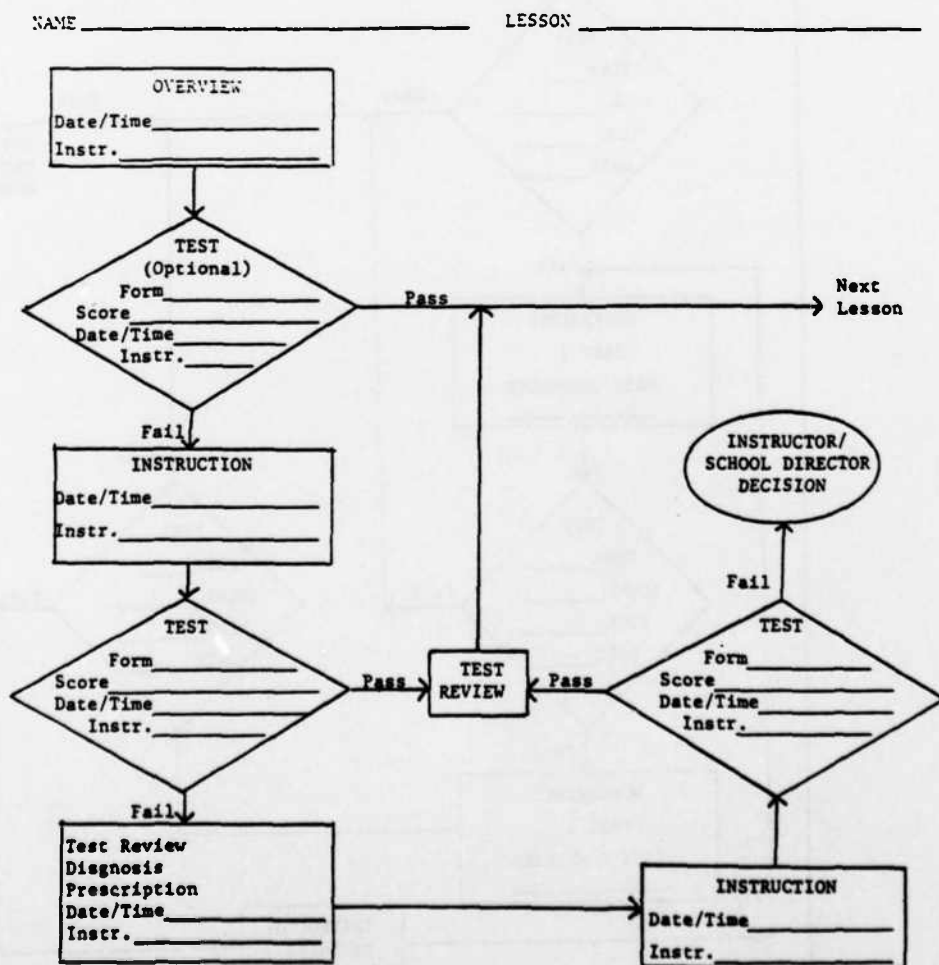
27. In the system below, what will a student do after passing the second test?

    a.   Go to worksheets part 2.
    b.   Be "recycled."
    c.   Enter the next module.
    d.   It is the instructor's decision.
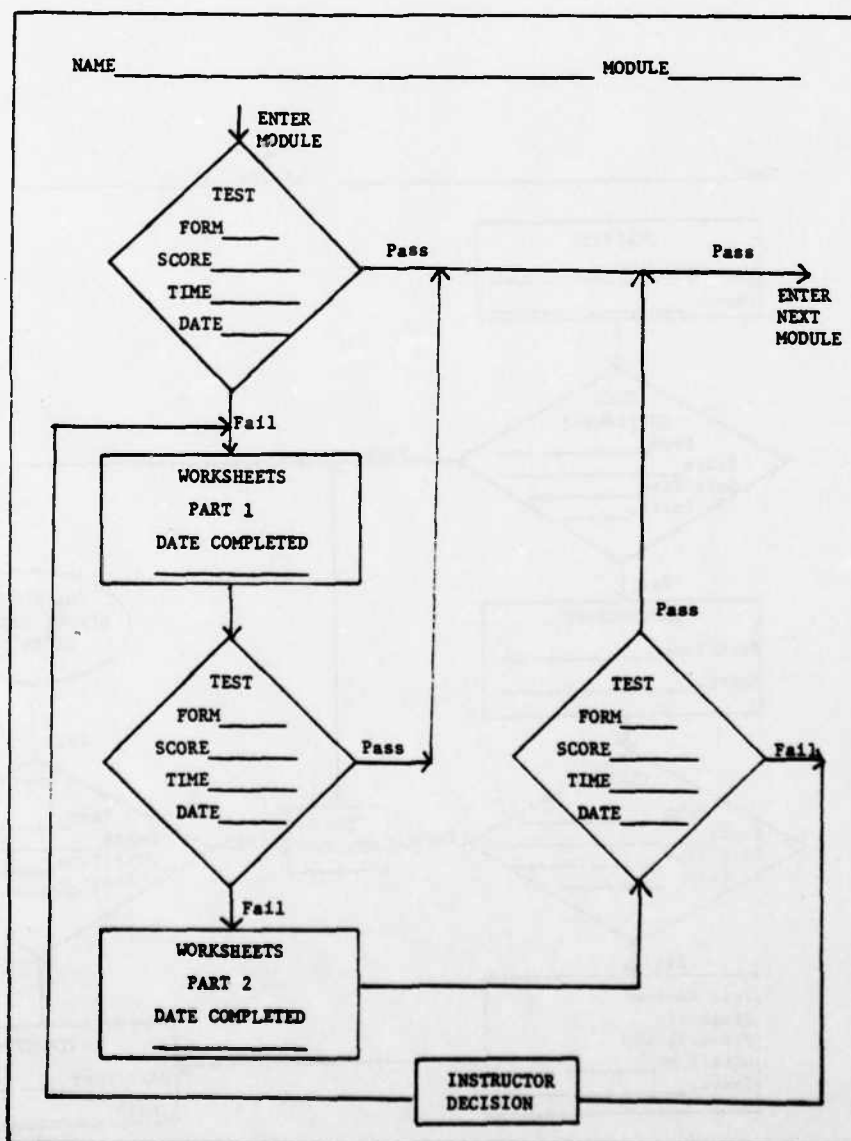
28. In the system shown below, what would a student do if he or she failed the test for the third time?

   a. It is the instructor's/school director's decision.
   b. Be retested immediately.
   c. Receive a diagnosis and prescription.
   d. Go to the next lesson after test review.

NAME _____   LESSON _____

29. In the system shown below, what would a student do next after completing all numbered lessons?

    a. Be "recycled."
    b. Take the mastery test.
    c. It is the instructor's decision.
    d. Take the diagnostic test.
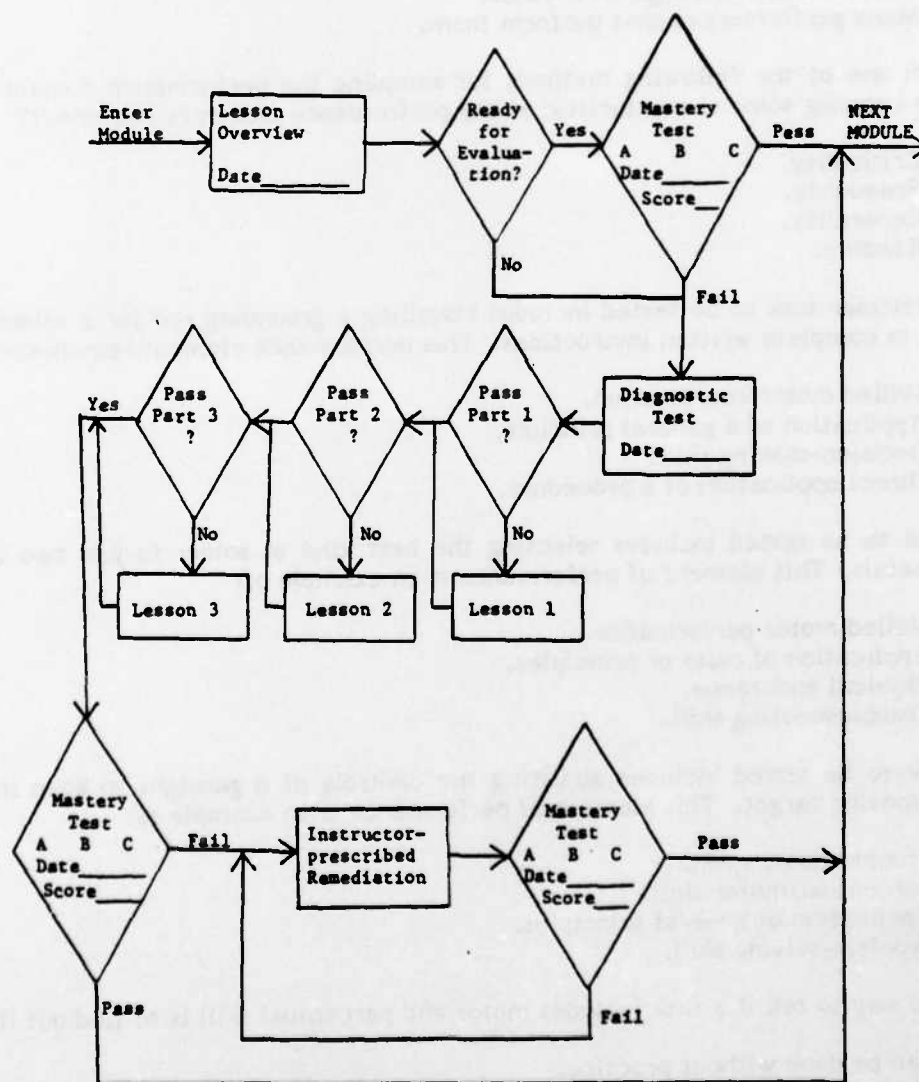
30. In planning a test, which one of the following should you do first?

   a. Determine what you are going to measure.
   b. Detemine whether to use a paper-and-pencil test.
   c. Determine how long the test should be.
   d. Determine how you will sample the domain.

31. Which one of the following is a good reason to include frequently performed tasks in a test?

   a. They are obviously important to the job.
   b. They are easier to perform.
   c. They usually have high error rates.
   d. Many performers cannot perform them.

32. Which one of the following methods for sampling the performance domain does not depend on knowing some characteristic of the performance elements you select?

   a. Criticality.
   b. Frequency.
   c. Generality.
   d. Random.

33. A particular task to be tested includes installing a grounding rod for a telephone set, according to complete written instructions. This performance element requires primarily:

   a. Skilled motor coordination.
   b. Application of a general principle.
   c. Decision-making skill.
   d. Direct application of a procedure.

34. A task to be tested includes selecting the best kind of solder to join two different types of metals. This element of performance is an example of:

   a. Skilled motor performance.
   b. Application of rules or principles.
   c. Physical endurance.
   d. Troubleshooting skill.

35. A task to be tested includes adjusting the controls of a gunsight to keep its cross-hairs on a moving target. This element of performance is an example of:

   a. Troubleshooting skill.
   b. Perceptual/motor skill.
   c. Application of general principles.
   d. Problem-solving skill.

36. A good way to tell if a task includes motor and perceptual skill is to find out if it:

   a. Can be done without practice.
   b. Is done frequently.
   c. Requires special equipment.
   d. Is done by the more experienced personnel.

37. A disadvantage of hands-on tests, compared to paper-and-pencil tests, is that hands-on tests:

    a.   Are more likely to ask for irrelevant information.
    b.   Cost more to administer.
    c.   Depend more on reading skill.
    d.   Must be based on learning objectives.

38. Which one of the following is an Important reason for writing a "pool" of items for any paper-and-pencil test?

    a.   Students should be given a choice of which items they will answer.
    b.   Some of the items will probably be discarded as a result of test tryouts.
    c.   Each knowledge element should be tested by several different types of items.
    d.   In a training course, each test item should only be used for a few weeks at most.

39. Which one of the following types of test items requires the student to recall the right answer from memory, not just recognize it?

    a.   True/false.
    b.   Free response.
    c.   Multiple-choice.
    d.   Matching.

40. One important reason not to use true/false test items is that:

    a.   True/false items are too difficult for students to answer.
    b.   True/false items can only cover rules and principles.
    c.   Most false statements are hard to understand.
    d.   Few statements are all true or all false.

41. An important rule to follow in constructing matching items is to:

    a.   Make all elements on the lists the same type.
    b.   Make both lists very long.
    c.   Use only negatively stated items.
    d.   Ask only about nomenclature.

42. An advantage of product-scoring in performance tests is that product-scoring:

    a.   Can measure motor skills, but process-scoring cannot.
    b.   Allows a wider variety of learning objectives to be measured.
    c.   Does not require the use of scoring aids.
    d.   Makes It easier to standardize the test from student to student.

43. An Important general rule to follow when constructing process-scored measures Is to:

    a.   Put only a single action into each measure.
    b.   Put all safety performance measures at the beginning of the test.
    c.   Avoid the use of scoring aids.
    d.   Include as many actions as possible in the test.

44. An important rule to follow in conducting a performance test is to :

    a.   Set up the station the same way for each student tested.
    b.   Allow the student to use any job manuals he or she brings to the test.
    c.   Vary the layout of the station to maintain test security.
    d.   Conduct the test outdoors in daylight on a clear day.

45. You are about to conduct the expert tryout of a paper-and-pencil test. Which one of the following persons would be the best test subject for the tryout?

    a.   An E-7 who had just been assigned as an instructor.
    b.   The honor graduate of the most recent graduating class.
    c.   A new student who had not gone through the course yet.
    d.   An E-4 who was processing out of the service.

46. You are conducting the validation of a paper-and-pencil test with masters and nonmasters. For a test item to be acceptable:

    a.   A greater proportion of nonmasters must pass the item.
    b.   A greater proportion of masters must pass the item.
    c.   The same proportion of masters and nonmasters should pass the item.
    d.   A majority of both masters and nonmasters should pass the item.

47. You are conducting the expert tryout of a hands-on test. Which one of the following is the most important question you are trying to answer?

    a.   Have the experts practiced the task?
    b.   Would nonexperts pass each measure?
    c.   Which one of the experts is the most proficient performer?
    d.   Do persons scoring the performance measures agree?

48. You are selecting persons to be tested in the validation of a hands-on test. Which type of test subject should you select?

    a.   Persons who have never done the task.
    b.   Persons who know how to do the task.
    c.   Persons who are just learning the task.
    d.   Persons who are not sure if they can do the task.

49. Below are some data from the validation of a paper-and-pencil test. Compute the agreement index.

	Masters	Nonmasters
Pass	9	5
Fail	6	12

Formula: $(A \times D) - (B \times C)$ = Agreement index

Agreement Index = _____.

50. Below are some data from the validation of a hands-on test. Compute the scorer agreement.

Scorer Pair

		1&2	1&3	1&4	2&3	2&4	3&4	Total Agree(A)	Total Disgaree(D)
	1	D	A	A	D	D	A	3	3
	2	A	A	A	A	A	A	6	0
Student	3	D	D	A	A	D	D	2	4
	4	D	A	D	D	A	A	3	3
	5	A	A	A	A	A	A	6	0

Scorer agreement = _____ percent.

Answer Key (Test Form B)

1.	d.	20.	b.
2.	c.	21.	c.
3.	d.	22.	d.
4.	Variable content.	23.	c.
	Variable time.	24.	c.
	Fixed method.	25.	a.
5.	Variable content.	26.	c.
	Variable time.	27.	c.
	Fixed method.	28.	a.
6.	Fixed content.	29.	b.
	Variable time.	30.	a.
	Fixed method.	31.	a.
	Fixed achievement level.	32.	d.
7.	Fixed content.	33.	d.
	Variable time.	34.	b.
	Fixed method.	35.	b.
	Fixed achievement level.	36.	a.
8.	Fixed content.	37.	b.
	Variable time.	38.	b.
	Fixed method.	39.	b.
	Fixed achievement level.	40.	d.
9.	d.	41.	a.
10.	c.	42.	d.
11.	b.	43.	a.
12.	d.	44.	a.
13.	a.	45.	a.
14.	d.	46.	b.
15.	a.	47.	d.
16.	b.	48.	b.
17.	c.	49.	78.
18.	a.	50.	66-2/3 percent (or 67%).
19.	c.		

APPENDIX C

COURSE FORMS

<u>Note</u>.   Reproduce these forms as is or revise them as needed for use in your course.

SAMPLE STUDENT PROGRESS CARD

NAME _____   LESSON _____

OVERVIEW
Date/Time _____
Instr. _____

TEST (Optional)
Form _____
Score _____
Date/Time _____
Instr. _____

Pass → Next Lesson

Fail

INSTRUCTION
Date/Time _____
Instr. _____

TEST
Form _____
Score _____
Date/Time _____
Instr. _____

Pass → TEST REVIEW ← Pass

Fail

Test Review
Diagnosis
Prescription
Date/Time _____
Instr. _____

INSTRUCTOR/ SCHOOL DIRECTOR DECISION

Fail

TEST
Form _____
Score _____
Date/Time _____
Instr. _____

INSTRUCTION
Date/Time _____
Instr. _____

C-1

INDIVIDUALIZATION SYSTEM CHECKLIST

_____ 1. Have you provided a means for the student to know how to get started?

_____ 2. Have you provided a means for the student to know what to do next?

_____ 3. Have you provided a means for the student to know the lesson objectives?

_____ 4. Have you decided whether the students can skip the lesson pretest?

_____ 5. Have you decided whether the students can "challenge" the lesson test?

_____ 6. Have you provided a means for the student to know if she or he is ready for the lesson test?

_____ 7. Have you provided a means for the instructor to know if the student is ready to be tested?

_____ 8. Have you determined how long a student can spend on a particular test?

_____ 9. Have you determined if there is to be a minimum time to spend studying between test and retest?

_____ 10. Have you determined how long a student may spend on a particular lesson?

_____ 11. Have you set the criterion for passing a lesson?

_____ 12. Have you devised a means for the instructor to know where the student is located in the program?

_____ 13. Have you determined what the instructor will do if a student is too slow?

_____ 14. Have you determined what the instructor will do if a student has "free time?"

_____ 15. Have you provided a means for the instructor to know if a student needs extra help?

_____ 16. Have you provided a means for the student to know if he or she needs extra help?

_____ 17. Have you provided a means for a student to get extra help?

_____ 18. Have you determined how long a student can take to complete the course?

_____ 19. Have you set the criterion for passing the course?

EXPERT TRYOUT QUESTIONNAIRE

1. Do you think you answered each item correctly?

      A. Yes.   B. No.   C. Not sure.

      (Go to 4.)   (Go to 2.)   (Go to 3.)

2. Which items do you think you did not answer correctly?

3. Which items are you unsure about?

4. Is this test realistic? (Does it reflect how the job is done?)

      A. Yes.   B. No.   C. Not sure.

5. Were the words or phrases in the test easy to understand? (If "No," indicate in the space below the words or phrases that gave you trouble.)

      A. Yes.   B. No.   C. Not sure.

6. Are all of the alternatives to each item believable? (If "No, indicate the alternatives that are not believable.)

      A. Yes.   B. No.   C. Not sure.

7. Are all the items relevant to the job? (If "No" or "Not sure," indicate the items that should be deleted.)

      A. Yes.   B. No.   C. Not sure.

8. As the test is now written, do you think it is a fair measure of a student's ability to perform on the job?

      A. Yes.   B. No.   C. Not sure.

SUGGESTED ACTIONS IF TEST IS NOT ACCEPTABLE TO EXPERTS

Question	Answer		Possible Actions
1	B or C	a.	Check that answer is correct.
		b.	Check "wrong" alternatives are incorrect.
		c.	Rewrite stem.
		d.	Rewrite situation.
		e.	Rewrite alternatives.
2			N/A
3			N/A
4	B	a.	Check that answer is correct.
		b.	Add illustration.
		c.	Rewrite situation.
		d.	Consider hands-on testing.
5	B	a.	Rewrite entire item.
		b.	Add illustration.
6	B	a.	Change unbelievable alternatives.
7	B	a.	Delete entire item.
		b.	Rewrite situation.
8	B or C	a.	Probe for more information on preceding questions.

TABLE FOR RECORDING SCORES TO VALIDATE
PAPER-AND-PENCIL TESTS

										ITEM NUMBER		
NAME	M/N	1	2	3	4	5	6	7	8	9	10
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
11.											
12.											
13.											
14.											
15.											
16.											
17.											
18.											
19.											
20.											
21.											
22.											
23.											
24.											
25.											
26.											
27.											
28.											
29.											
30.											

COMPUTING THE AGREEMENT INDEX

	MASTERS	NONMASTERS
PASS	A	B
FAIL	C	D

$$\left\{ \begin{array}{c} A \\ \square \end{array} \times \begin{array}{c} D \\ \square \end{array} \right\} - \left\{ \begin{array}{c} B \\ \square \end{array} \times \begin{array}{c} C \\ \square \end{array} \right\} = \begin{array}{c} \text{Agreement Index} \\ \square \end{array}$$

HANDS-ON TEST QUESTIONNAIRE

		Yes	No
1.	Is the task covered by the test a job requirement?	__	__
	If not, why not?		
2.	Does the test provide a fair measure of job requirements?	__	__
	If not, what changes are required?		
a.	Add performance measures?	__	__
	Which ones?		
b.	Delete performance measures?	__	__
	Which ones?		
c.	Modify performance measures?	__	__
	How?		
d.	Alter standards?	__	__
	How?		
e.	Clarify instructions?	__	__
	How?		
f.	Change test site or equipment requirements?	__	__
	How?		

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  ment School
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Officer in Charge, Central Test Site for Personnel and Training Evaluation Program
Commander, Air Force Human Resources Laboratory, Williams Air Force Base (CNET
  Liaison Office AFHRL/OTLN)
Commandant Coast Guard Headquarters
Superintendent, U.S. Coast Guard Academy

DATE
TILME

43. An Important general rule to follow when constructing process-scored measures is to:

    a. Put only a single action into each measure.
    b. Put all safety performance measures at the beginning of the test.
    c. Avoid the use of scoring aids.
    d. Include as many actions as possible in the test.

Pass	9	5
Fail	6	12

Formula: $(A \times D) - (B \times C)$ = Agreement index

Agreement index = _____.

B-24

B-25

Diagnosis
Prescription
Date/Time_____
Instr._____

INSTRUCTION
Date/Time_____
Instr._____

Diagnosis
Prescription
Date/Time_____
Instr._____

INSTRUCTION
Date/Time_____
Instr.